ELECTRICAL TIMES

THURSDAY
6 DEC.
1951
NINEPENCE

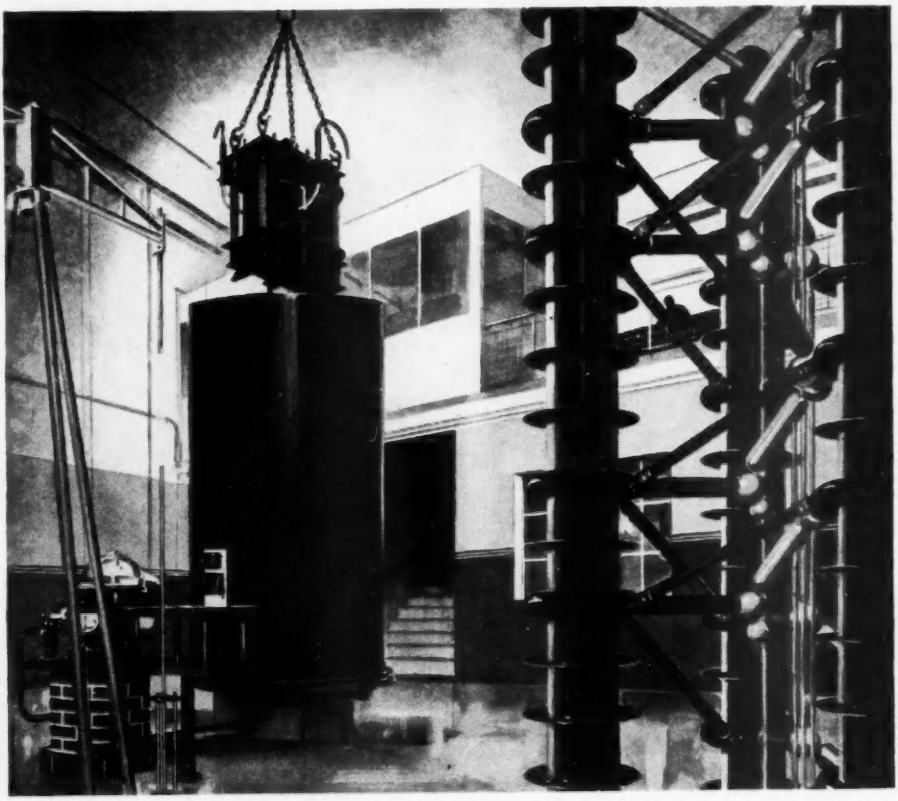
FERRANTI
Generator
TRANSFORMERS

A 58·5 MVA 11/134 kV FERRANTI GENERATOR TRANSFORMER for Braehead Power Station, leaving the Ferranti Transformer Factory at Hollinwood.

FERRANTI

FERRANTI LIMITED
HOLLINWOOD · LANCASHIRE
LONDON OFFICE: KERN HOUSE · KINGSWAY · W.C.2

F.T.108c



Apparatus being lowered into insulating tank.

Trial scene . . .

This is the scene of many transformer tests and trials—a section of the modern High-Voltage Laboratory, incorporated in the reconstruction and re-equipment of the B.E.T. works at Hayes. Here new knowledge is constantly being added to the experience gained by the B.E.T. in its 50 years of transformer specialisation.

BET

The
British Electric Transformer
Company Limited

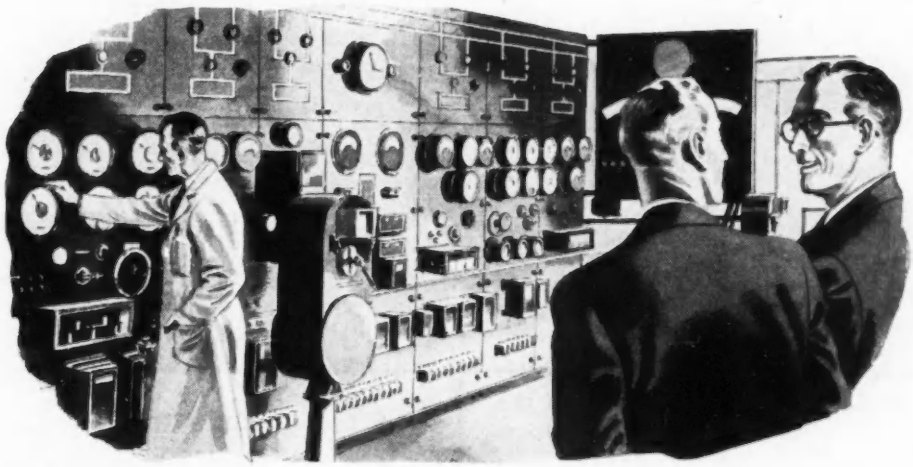
In Association with **CROMPTON PARKINSON LTD., CROMPTON HOUSE, ALDWYCH, LONDON, W.C.2**
Telephone : Chancery 3333. *Telegrams : Crompark, Estrand, London.*

...and not a penny on battery repairs in 12 years?*

Yes—*AND 740 cells in use*

What's so special about Nife?

They're made of *STEEL—an engineering job*



* *These are the actual details of the performance of Nife batteries operated by a Municipal Authority.*

Every Nife battery is a superb example of precision engineering in steel. This technical perfection is the reason why there is 'longer life in a Nife'—and almost complete freedom from replacement costs.

ROBUST CONSTRUCTION Made of steel — case and plates — a Nife battery has enormous mechanical strength. It is practically indestructible.

COMPLETE RELIABILITY The almost inert electrolyte is actually a steel preservative—so that the battery does not deteriorate even during long periods of inactivity. It will withstand the heaviest rates of charge or discharge — and recover its voltage almost immediately.

SIMPLE MAINTENANCE A Nife is, for all practical purposes, free from self-discharge — the steel plates cannot buckle or shed active material and there is no corrosion of terminals.

(*N.B. Nife Batteries are not yet available for private cars or domestic radio.*)

N25

NIFE STEEL BATTERIES

REPAY THEIR ORIGINAL COST MANY TIMES OVER

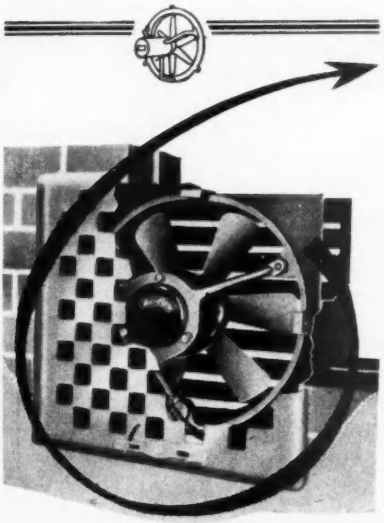
NIFE BATTERIES · REDDITCH · WORCESTERSHIRE

A

Ventilation
by
FENTON, BYRN & Co LTD

THE WALL FAN . . . .

delivery from 115 - 2,250 cu. ft. of air per minute. Fixed or closable grilles to prevent back-draughts, also Light-proof attachments for Dark Rooms. Designed to recess in the wall. Sizes 6″, 9″, 12″, 16″. Price from £6 . 19 . 6



WALL FANS · PROPELLER FANS · MOTORISED ROOF COWLS · WINDOW VENTILATORS WINDOW FANS · SPACE HEATERS DESK AND CEILING FANS COMPLETE VENTILATING SCHEMES AND ANCILLARY EQUIPMENT

Air-flow

FENTON, BYRN & CO. LTD., AIRFLOW WORKS, BERRYLANDS ROAD, SURBITON, SURREY
Ventilating Engineers - Fan Manufacturers 'Phone: Elmbridge 6724/5 'Grams: Airlation, Surbiton

---

A new range of
Lighting Fittings
—Your copy on request

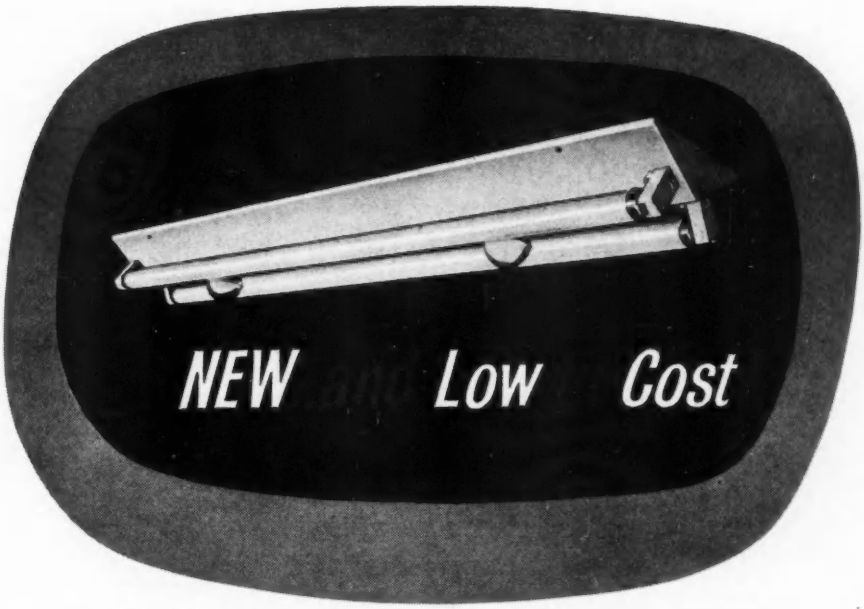
WILLIAM J. McGEOCH & CO. LTD.
BORDESLEY, BIRMINGHAM 10
28 WEST CAMPBELL ST., GLASGOW C.2
43 BERNERS STREET, LONDON W.1
26 ELDON SQ., NEWCASTLE-ON-TYNE

Shunt Field Regulators

For Motors, Generators and Alternators. Also as Series Regulators for voltage, heat and speed control. We shall be pleased to send full particulars and prices on request. And remember, the advice of Cressall Technicians is always available.

CRESSALL

Registered Trade Name of
THE CRESSALL MANUFACTURING CO., LTD.,
Tower Street, Birmingham 19.
Telephone: ASTon Cross 2666 (3 lines)
Telegrams: "OHMIC," Birmingham.



"TEVIOT 2440" *Instant Self-start Tungsten Ballast Fluorescent Fitting constructed of heavy gauge sheet steel finished white stove enamel*

LIST PRICE ONLY
(exclusive of lamps)

£5 1s. 0d.

Tungsten Ballast Lamps. (Bowl obscured) 5/- each, plus Purchase Tax 1/4. Instant self-start Fluorescent Lamps. (MCFB/U) 17/- each, plus Purchase Tax 4/5.

Outstanding Features

- *Low initial cost.*
- *Complete elimination of the usual forms of control gear.*
- *Self-starting.*
- *Pleasing colour.*
- *Relatively unaffected by voltage fluctuation.*
- *High efficiency.*
- *High power factor.*
- *Simple in construction.*
- *Easy to erect and maintain.*

FALKS
FALK, STADELMANN & CO. LTD

91, FARRINGDON ROAD, LONDON, E.C.1

84/530

"I like to install a motor I can trust and I have to give my customers good value . . .

THAT'S WHY I RECOMMEND BROOK!"

—SAYS

THE ELECTRICAL CONTRACTOR

Electrical contractors have installed the larger proportion of the one million BROOK motors now in existence. Their choice of motor reflects their confidence in the reliability of BROOK products.

Modern production methods plus concentration on the making of A.C. motors, and nothing else, make BROOK the best value to be obtained anywhere in the world.

Screen protected.

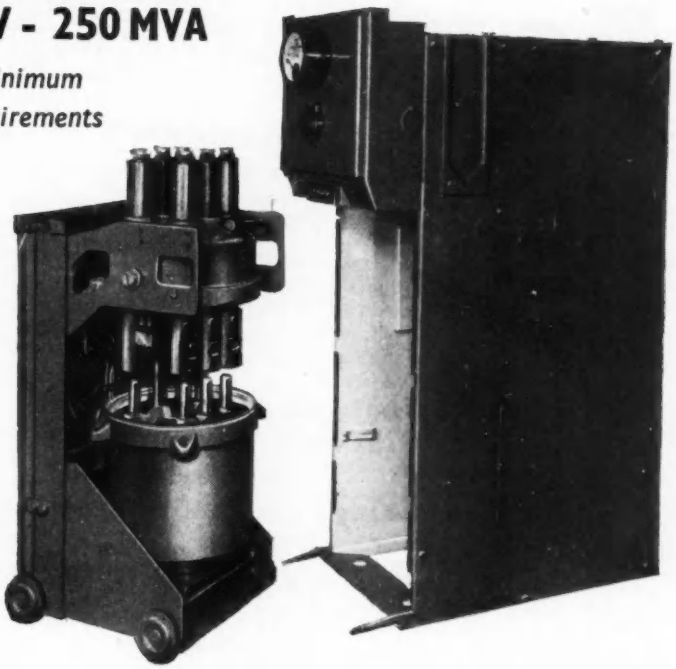
BROOK MOTORS Ltd

HUDDERSFIELD • ENGLAND

1.HZ.177

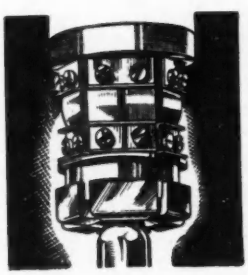
FOR H.V. ELECTRICITY SUPPLY DISTRIBUTION UP TO 11 kV - 250 MVA

with minimum space requirements



and **RELIABILITY IN SERVICE**

Innumerable short circuit tests prove the dependability of the **BV UNIT**



The 'FERGUSON PAILIN' BV unit is self-contained, of the metalclad type, giving adequate protection against fire risks, and designed for extension to similar, or other, switch units and isolators as required.
Each circuit breaker is contained in its own truck, giving easy access for inspection or maintenance, and is interchangeable with other units where ratings and small wiring interconnections are identical.
Vertical isolation of the breaker ensures minimum space requirements of the unit, whilst adequate interlocks make opening and closing operations completely safe and prevent mal-operation.

The separate spring loaded segments of the fixed contact in an oil circuit breaker contact assembly (cross jet pot removed). This feature ensures perfect alignment when the lower contact moves into the closed position.
Full data gladly supplied on request

Performance proved — A.S.T.A. Certificated

FERGUSON PAILIN LTD.
MEMBER OF THE AEI GROUP OF COMPANIES
Switchgear Specialists
MANCHESTER, 11. ENGLAND

C.M.A.-CABLES

In the air, on sea or on land, all scientific triumphs call for the finest and most reliable equipment.
Therefore when cables are required, always specify

C.M.A.

MEMBERS OF THE C.M.A. & AFFILIATED MANUFACTURERS' ASSOCIATIONS

British Insulated Callender's Cables Ltd.
Connollys (Blackley) Limited.
The Craigpark Electric Cable Company Limited.
Crompton Parkinson Limited.
Enfield Cables Limited.
The Edison Swan Electric Company Ltd.
Greengate & Irwell Rubber Company Limited.
W. T. Glover & Company Limited.
W. T. Henley's Telegraph Works Company Limited.
Johnson & Phillips Limited.
Liverpool Electric Cable Company Ltd.
Metropolitan Electric Cable & Construction Co. Ltd.
Pirelli-General Cable Works Limited (The General Electric Co. Ltd.).
Siemens Brothers & Company Limited (Siemens Electric Lamp & Supplies Limited).
St. Helens Cable & Rubber Company Ltd.
Standard Telephones & Cables Limited.
The Telegraph Construction and Maintenance Co. Ltd.

MAINS CABLE MANUFACTURERS ASSOCIATION
MAINS CABLE MANUFACTURERS ASSOCIATION (SUPER-TENSION)
RUBBER & THERMOPLASTIC CABLE MANUFACTURERS ASSOCIATION
Affiliated to
CABLE MAKERS ASSOCIATION
52-54 High Holborn, London, W.C.1. Tel: Holborn 7633

ask your moulder...

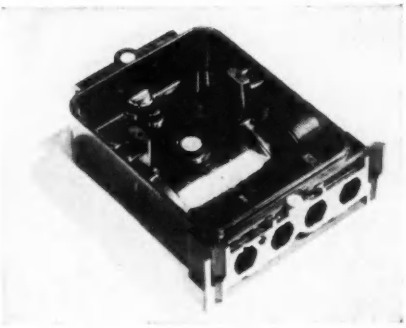
This is the fourth in a series of announcements designed to assist Buyers in purchasing plastics-moulded articles or components.

Buyers must sometimes be alarmed by the tendency shown by many moulders to alter specified designs. In their efforts to cut prices, to simplify tools and moulding procedures, moulders have been known to make such changes that the resultant mouldings, though no doubt serviceable, were different from what was originally visualised.

You will have your own very good reasons for laying out a design in a certain way, even though it incorporates unorthodox or inconvenient features. You must be guided, of course, by your moulder's advice as to what can or cannot be moulded but his technical skill should be sufficient to enable him to meet your precise requirements.

When you are negotiating with a moulder, therefore, be very careful to ascertain whether his policy is to mould what *you* want, or to alter your designs to suit his convenience. If a moulder is to prove worthy of your job he should be prepared to exercise his ingenuity to produce it—and to produce it economically—to your specifications.

This does not mean that you should never accept alterations. A good moulder can very often suggest modifications which, without altering the functional purpose of the moulding or detracting from its appearance, can effect a substantial saving of time and money. This point is illustrated in the example given here.



The problem in this moulding (shown sectioned) was the long undercuts. The design was originally laid out so that the cable fixing and shunt insert holes could be cored from the outside. The resulting holes in the end wall were to be filled afterwards by separate mouldings, glued into position. The moulder tackled the job on the basis of withdrawing the cores inwards. This eliminated the need for separate mouldings and their gluing, with a consequent saving in cost; and improved appearance by ensuring that no joint faces would appear on the outside surfaces. Mouldings by The Streetly Manufacturing Co. Ltd. for Ferranti Ltd.

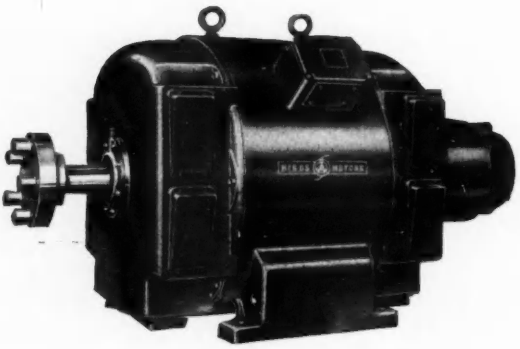
If in doubt, ask **STREETLY**

The Streetly Manufacturing Co. Ltd. makes mouldings in thermosetting and thermoplastic materials and specialises in long runs of the highest quality mouldings. A high percentage of its regular output is of mouldings for manufacturers of electrical equipment and accessories. If you have a moulding job in view, call in Streetly for practical, down-to-earth advice.

THE STREETLY MANUFACTURING COMPANY LIMITED,
STREETLY, SUTTON COLDFIELD, Nr. BIRMINGHAM
TELEPHONE: STREETLY 78411. TELEGRAMS: BANG STREETLY

B·I·P GROUP

TRADE +
HIGGS MOTORS LTD.
CHAIRMAN WALTER F. HIGGS, M.I.E.E.
MARK −
BIRMINGHAM 6 ENGLAND



Our range of large AC machines covers a wide variety of outputs and enclosures: leaflet 90 gives a brief description of motors and generators over 100 h.p. and specific enquiries receive careful and expeditious attention

GUARANTEED FOR EVER

Belfast, Birmingham, Bristol, Dundee, Glasgow, London, Manchester, Newcastle, Peterborough, Sheffield, Wolverhampton

Tenby ACCESSORIES ARE IN SHORT SUPPLY

If your Wholesaler can't always supply your Tenby requirements "off the shelf", don't blame him.

Shortages of raw material and increasing demands are making it very difficult for us to keep everyone adequately supplied. We are doing our best, and you can help us by remembering that . . .

A clip on the wall is worth a gross on the floor!

Tenby ELECTRICAL ACCESSORIES

MANUFACTURED BY

S. O. BOWKER LTD.

BIRMINGHAM: 19/21 Warstone Lane, Birmingham, 18 Tel.: CENtral 3701
LONDON: 54/56 Oxford Street, London, W.1 Tel.: MUSeum 4695
MANCHESTER: 85 Mosley Street, Manchester, 1 Tel.: CENtral 0051
LEEDS: 5 Park Place, Leeds Tel.: LEEDS 23793

THE NAME IS *Best* FOR QUALITY

This "BEST" COFFEE PERCOLATOR has a 2½-pint capacity, almost instant percolation, a special "keep hot" device and an automatic safety cut-out for the heater. Elegant in design and of superb craftsmanship in heavy gauge copper, it is finished in polished chrome. Loading 500 watts —A.C. only, 100/120, 200/220 and 230/250 volts.

"BEST" ELECTRIC KETTLE

Nominal capacity 3½ pints, the "BEST" Electric Kettle is beautifully made in solid copper with polished nickel or chromium finish (tinned internally). 1250-watt heater with Automatic Safety Connector-Ejector. For 100/120, 200/220, 230/250 volts, A.C./D.C.

"BEST" ELECTRIC JUGS

are useful alternatives to kettles for hot or boiling water supply. Their chromium plated repoussé finish on solid copper graces any table, and special insulated feet protect even the most highly polished surfaces. Capacity: 2 pints (700 watts), or 4 pints (1250 watts); voltages as above.

SPARE "BEST" ELEMENTS

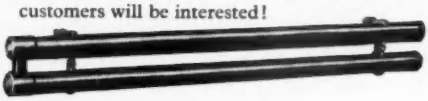
of Non-Automatic and Automatic Safety Connector-Ejector types are of thoroughly reliable construction. Two sizes: 700 watts for 2-pint kettles, and 1250 watts for 3½, 4 or 6-pint kettles. Automatic thermal switch (bimetal) elements are available, also higher loadings if required.

Best Products Ltd.

FELIX WORKS, FELIXSTOWE, SUFFOLK
Phone: Felixstowe 554. Grams: Best, Felixstowe
B12

FOR *draught* PREVENTION

Thermotube Electric Heaters are ideal for draught prevention and general temperature rise in smaller rooms, passages and landings. Tubes may be mounted singly or in banks of two, three or four, *without the need for changing terminal boxes.* This flexibility of installation is an important and appealing feature of Thermotubes, which can ease many a heating problem this winter. Your customers will be interested!

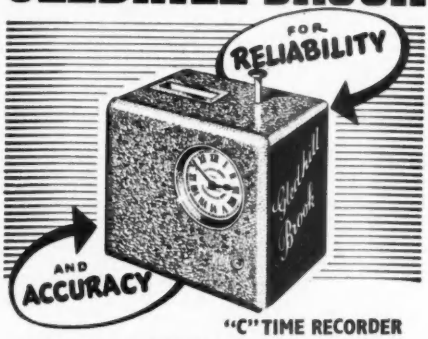


Thermotube
ELECTRIC HEATERS

The Thermovent Technical Advisory Service is always glad to help you with any problem of Space Heating.

THERMOVENT HEATING:
E. K. COLE LTD., 5 VIGO STREET, LONDON, W.1.

GLEDHILL-BROOK



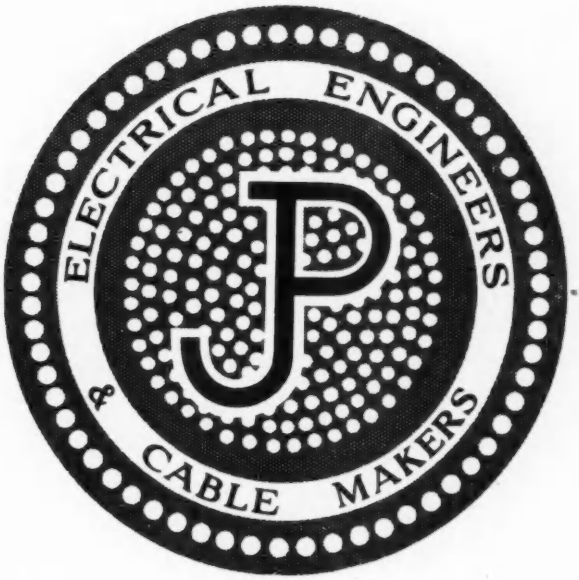
"C" TIME RECORDER
SPECIALLY DESIGNED FOR SMALL STAFFS

This useful GLEDHILL-BROOK Recorder is a handy portable size for small staffs. It records IN and OUT attendances as well as ON or OFF jobs. The clear and accurate time record is on the face of the card.

Available with an eight-day "G.B." mechanical clock movement with best quality lever escapement or the well-known "G.B." electric impulse movement. Soundly constructed in an all-steel case with cellulose finish.

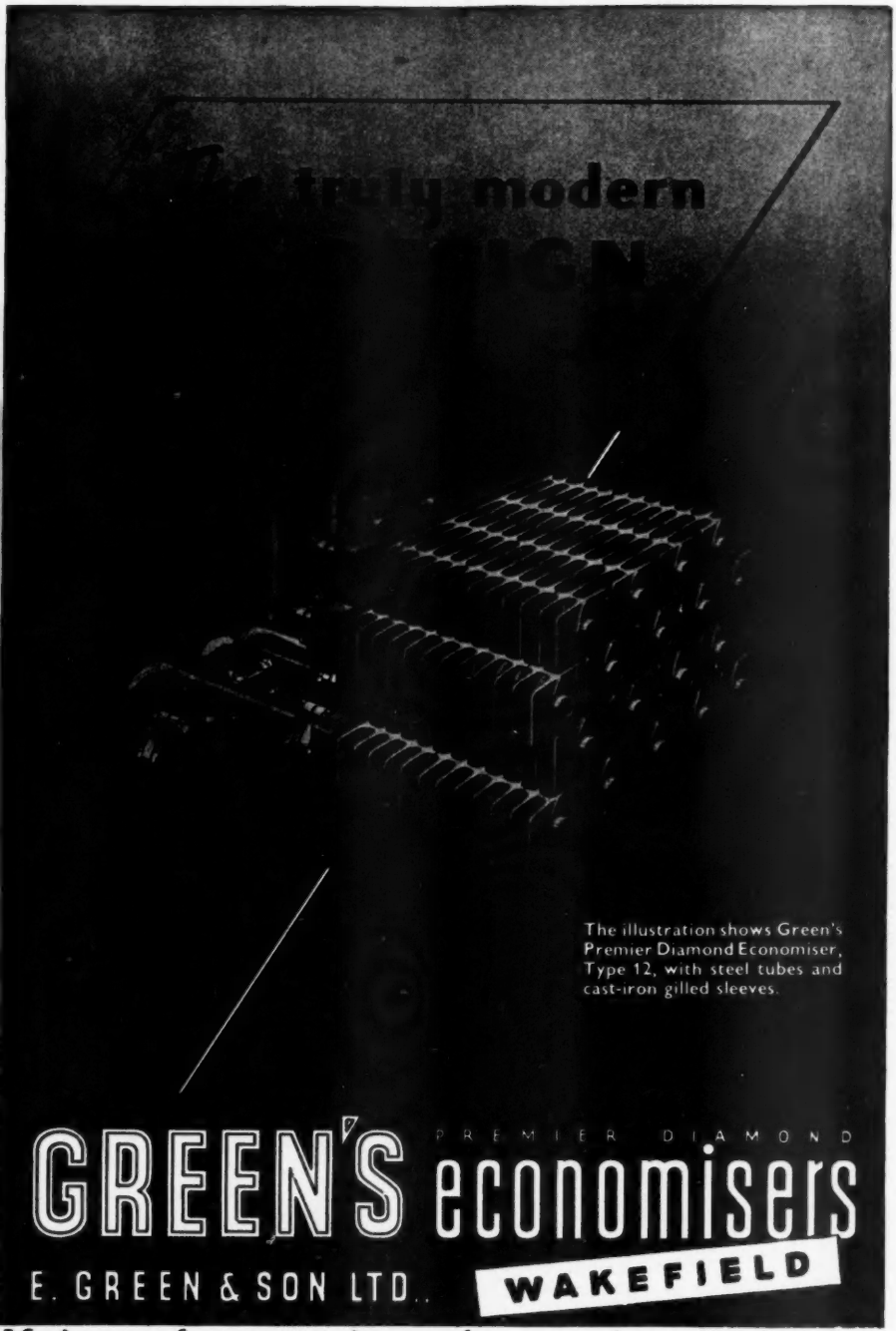
Enquiries to:—

GLEDHILL-BROOK TIME RECORDERS LTD.
60, EMPIRE WORKS • HUDDERSFIELD



The mark that means
that "little more" in quality

An advertisement of Johnson & Phillips Ltd.

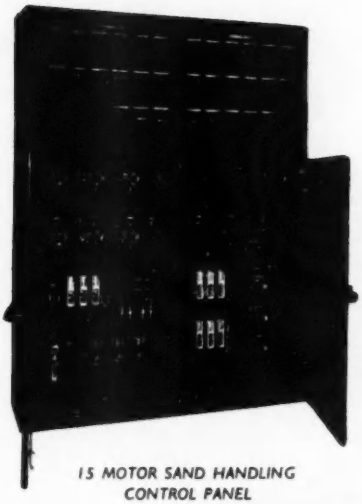


The illustration shows Green's Premier Diamond Economiser, Type 12, with steel tubes and cast-iron gilled sleeves.

PREMIER DIAMOND
GREEN'S economisers
E. GREEN & SON LTD., WAKEFIELD

Makers of economisers for one hundred years

GE 58



15 MOTOR SAND HANDLING CONTROL PANEL

IGRANIC ELECTRIC CONTROL GEAR

FOR . . .

EFFICIENT PROTECTION

OF VALUABLE MACHINERY AND FOR RELIABILITY SPECIFY....

IGRANIC CONTROL

OUR DISTRICT OFFICE STAFFS OF SPECIALIST ENGINEERS ARE READILY AVAILABLE TO ADVISE YOU ON THE SELECTION OF CONTROL GEAR APPROPRIATE TO YOUR PARTICULAR NEEDS

SPECIALISED CONTROL EQUIPMENT FOR....

- AIR COMPRESSORS
- BLAST FURNACES
- CRANES AND TRANSPORTERS
- COAL HANDLING
- COKE OVENS
- FOUNDRIES
- LIFTS
- LAUNDRIES
- MACHINE TOOLS
- MOVING BRIDGES
- PAPER MILLS
- PRINTING MACHINERY
- PUMPS
- RUBBER MILLS
- REFRIGERATION PLANT
- STEEL MILLS
- SKIP HOISTS
- STONE GRADERS AND CONVEYORS
- SHIPS
- TEXTILE MACHINES
- WELDING MACHINES

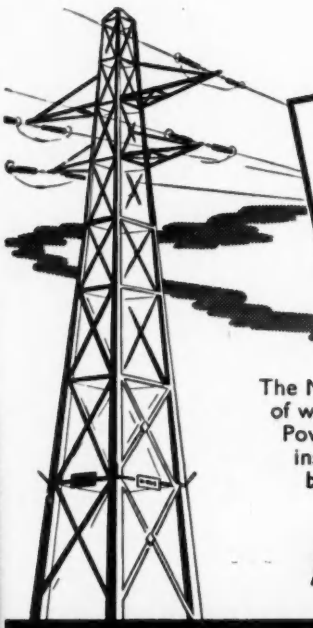
MOTOR IGRANIC CONTROL

IGRANIC ELECTRIC CO., LTD.

HEAD OFFICE AND WORKS — BEDFORD

EXPORT DEPT. — VICTORIA STATION HOUSE, 191 VICTORIA STREET, LONDON, S.W.1

BRANCH OFFICES—LONDON · BIRMINGHAM · BRISTOL · CARDIFF · GLASGOW
LEEDS · MANCHESTER · NEWCASTLE · SHEFFIELD



Protecting the Nation's Power Supply...

The Mulsifyre System, which extinguishes **oil fires** by use of water only, is specially designed for the protection of Power Station and Sub-Station equipment. Since the first installation, nearly 20 years ago, it has been adopted by electrical engineers in many parts of the world.

MULSIFYRE

MATHER & PLATT • LTD · MANCHESTER 10

order **SAX** quality **BELL PUSHES**

Bakelite and various brass finishes, well constructed and electrically highly efficient.

Other Products include
- **Bells**
- **Indicators**
- **Relays**
- **Transformers**
- **Wall Sockets & Plugs**

Diagrams and Illustrated Catalogue on application

TRADE MARK

JULIUS SAX & CO. LTD.
24 COMMERCE RD. BRENTFORD.
Telephone EALing 6034-5

ANNOUNCING

MODEL NO. **N.1600**

for SPEED INFORMATION and 3-WAY PROTECTION of CASH RECEIVED

A FOUR TOTAL RECEIPTING MACHINE

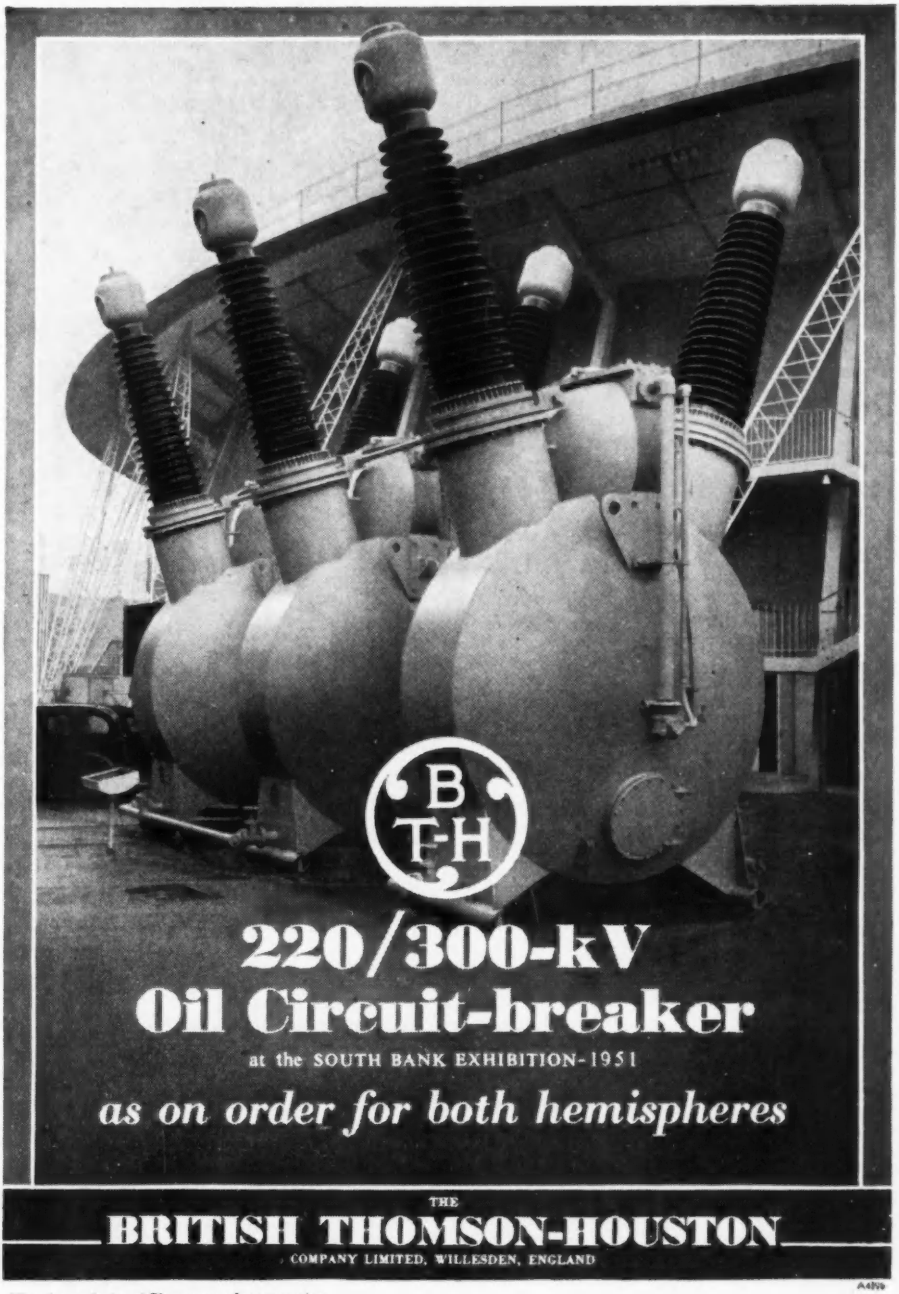
Providing 3 identical, non-carbon printed records of receipts on

1. The Customer's Account
2. The Receipt Posting Stub
3. The Locked-in Audit Record

National

ALL TOTALS UNDER LOCK & KEY

For details and demonstrations please write or phone
THE NATIONAL CASH REGISTER COMPANY LTD.
206 Marylebone Rd., London, N.W.1. Paddington 7070



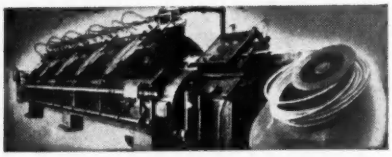
Member of the AEI group of companies

NON-FERROUS

WIRE

and telephones

MODERN TELEPHONE SYSTEMS demand wire of the best quality, manufactured to the most precise specifications. The Metals Division of I.C.I. is well-equipped to supply such wire, in high-conductivity copper, cadmium-copper, and bronze. The Division is pleased to help with all problems concerning fabricated non-ferrous metal products.



A modern plant for wire manufacture.

IMPERIAL CHEMICAL INDUSTRIES LTD LONDON SW1

ICI

M.182

Demand for ELECTRICITY has grown faster than the capacity to supply

A Power Crisis threatens this winter

BRITISH INDUSTRY is today using more than twice as much electricity as before the war, and substantially more than this time last year.

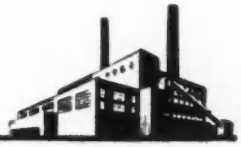
The war left Britain sadly short of generating plant. Now the new Rearmament drive calls for still more power. Export demands more again. That is the background picture.

Existing power stations could supply the demand — on one condition. This is that too many users of electricity do not switch on at the same time of day. When "Peak" demands go over a certain mark, power cuts become unavoidable.

The public is being asked to help. We are saying to them "Please don't switch on your electric fires during peak hours. If domestic users, shops, hotels and offices sacrifice a little comfort and leave the electricity to the factories during peak hours, we might get through this winter without power cuts at all. We would certainly manage it with greatly reduced interruptions."

Industries, in addition to their load-spreading arrangements, must use electricity with extreme efficiency and economy. Above all, there must be

NO WASTE



BRITISH ELECTRICITY

We are one Company operating in three different fields. In this advertisement we illustrate a product of the Electricity Meter Division.

GROWTH BY DIVISION

Polyphase meters of small dimensions and light weight, stable performance, low interaction and full compensation.

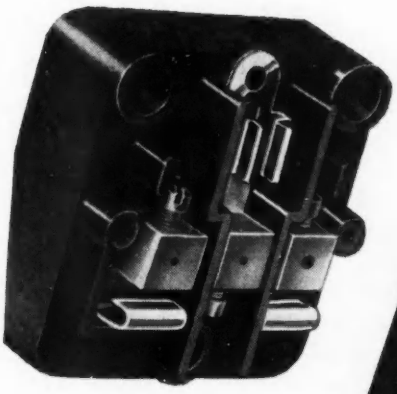
MEASUREMENT LTD

ELECTRICITY METER DIVISION, Tameside Works, Dobcross, Near Oldham, Lancs. Tel. No. Delph 291
HYDRAULICS DIVISION, 119 Union Street, Oldham, Lancs. Tel. No. Manchester Main 6432
REMOTE CONTROL DIVISION, Fitzalan St. Works, Kennington Road, London, S.E.11. Tel. No. Reliance 2406

A Company of the Parkinson & Cowan Group

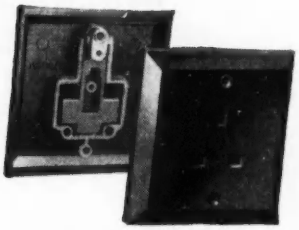
SWITCH OVER TO Ashley

Surface type
13 amp socket



★ *Complying with all Electrical and Mechanical Tests of British Standard* 1363.

● **Flush type 13 amp. socket**



Delays in deliveries are due to raw material shortages but available supplies are being allocated as fairly as possible in the circumstances.

Neat, simple and always reliable

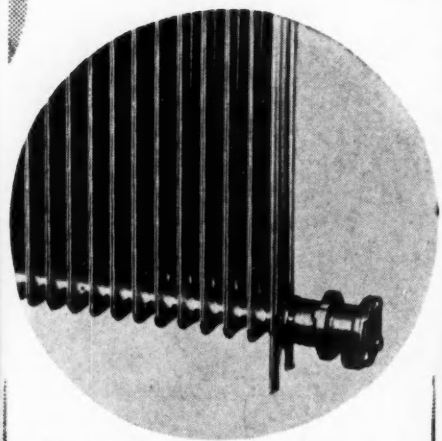
These are designed to accommodate the 13 amp. fused plugs to British Standard 1363, and are suitable for both ring main and non-ring installations, connected to A.C. mains, as specified by I.E.E. regulation No. 201C. Plugs are available fitted with cartridge fuses rated at 3, 7, or 13 amps. to customers' preference.

ASHLEY ACCESSORIES Limited, Dept. B

ULVERSTON, LANCASHIRE. Telephone: Ulverston 3333. Telegrams: "Rotary, Ulverston"

★ *If your Wholesaler does not stock this line, please send us a postcard* ★

NO DANGER OF FIRE with "DUNLOW" Flame Proof ELECTRIC RADIATORS



Ideal for Cellulose Spraying Rooms, Petroleum Stores, Operating Theatres, etc.

FLP ⬅ THIS IS YOUR SAFEGUARD

Where safety is the first consideration "Dunlow" Flameproof Heaters are essential. The heating unit in these radiators is similar to our water and oil

FLAMEPROOF IMMERSION HEATERS

Certified by Buxton

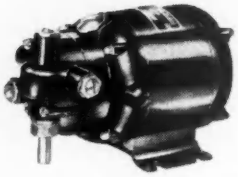
"Dunlow"

DUNCAN LOW LTD

293 BELL STREET GLASGOW C4

Geared

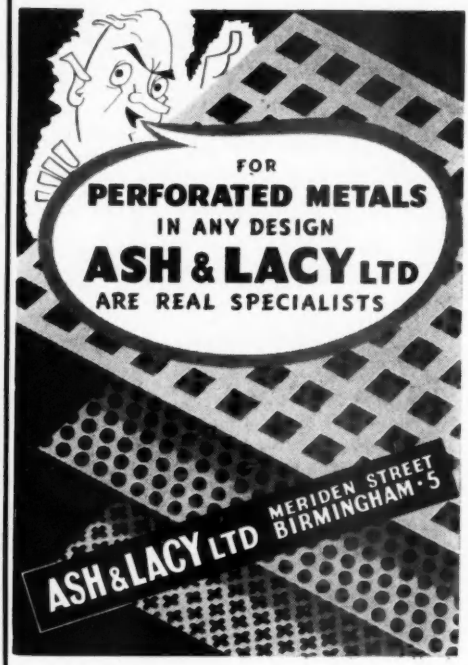
Electric Motor Units



Any Speed reduction
Max. Torque 4 lb. in.
6 in. × 3½ in. dia. $\frac{1}{50}$th H.P.

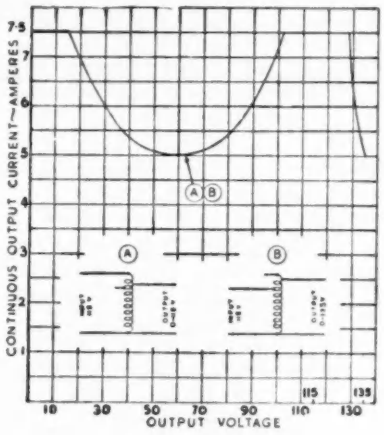
- Induction Shaded Pole
- Series and Repulsion
- Variable-Speed (Rheostat)

CITY ENGINEERING Co. (Boreham Wood) Ltd.
Manor Way - Boreham Wood - Herts.

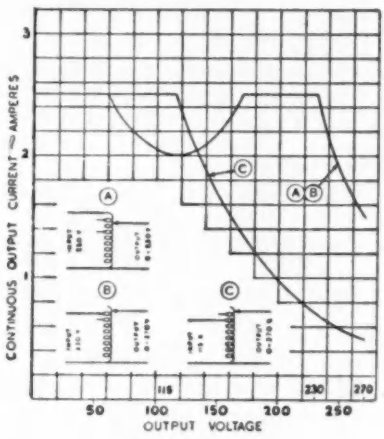


"VARIAC" voltage-regulating infinitely variable transformer

Reg^{d} Trade Mark



TYPES 200-C.U./C.M.



TYPES 200-C.U.H./C.M.H.

SERIES 200 "VARIAC" TRANSFORMERS

With a **"VARIAC"** voltages are instantly and minutely adjustable from O-Line Voltage. On some patterns, such as 200-C.U.H. there is even an "over voltage" feature. This can provide over line voltage, or compensate for low lines. Many other suggestions on the use of **"Variac"** Transformers are contained in Catalogue V549 which will gladly be sent on request.

- **1. Infinitely variable voltages.**
- **2. Smooth, precise adjustment.**
- **3. Dial calibrated in output voltage.**
- **4. Large current-handling ability.**
- **5. Excellent voltage regulation.**
- **6. Low temperature rise.**
- **7. Catalogue V549 (32 pages) gives full details of all available patterns, from 580 va to 7,000 va.**

TYPE 200-C.U.H.

CL2

CLAUDE LYONS LTD.

ELECTRICAL AND RADIO LABORATORY APPARATUS, ETC.

180 Tottenham Court Road, London, W.1, and 76 Oldhall Street, Liverpool, 3, Lancs.

GOOD NEWS!

TEMCO *the Perfect*
IRON CONNECTOR
is now available off the shelf

DELIVERIES FROM STOCK

No longer any need to accept any but the best—thanks to increased production the connector that everyone wants is now in plentiful supply.

- Made to B.S. 562.
- Visible earth terminal.
- Independent cord grip; no strain on conductors.
- 2-part phosphor-bronze ringed contact sleeves.
- Extra solid bakelite housing.
- Each one packed in a carton.

NO LOOSE PARTS

TEMCO
SUPER IRON CONNECTORS

Marketed by **T. M. C.-HARWELL (SALES) LTD**
37 UPPER BERKELEY STREET · LONDON W1
Telephone: PADdington 1867-8-9

One sale often leads to another . . .

when you sell a SADIA

EVERY SADIA you sell goes out to be a salesman—for *you!* There's nothing more persuasive than hot water cheerfully gushing at the turn of a tap. Or more pleasing than the Sadia's clean, gleaming lines. Or more convincing than a Sadia owner's story of its trouble-free economical service.

Sadias are built to last. Some of the first ever made—twenty-four years ago—are still working merrily away. That's why there's never a "come-back" when you sell a Sadia. You'll hear no more of it—except from the owner's friends and neighbours, who'll want Sadias for themselves.

SADIA
HOT WATER BY ELECTRICITY

Write for full details of latest models to:

AIDAS ELECTRIC LTD., SADIA WORKS, ROWDELL ROAD, NORTHOLT, GREENFORD, MIDDLESEX

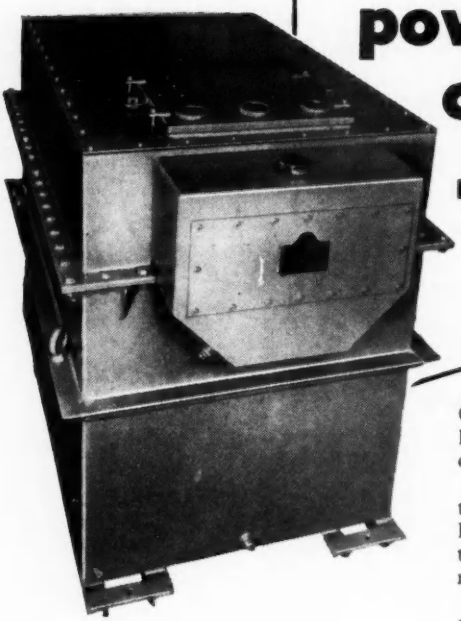
Standard

high voltage capacitors

for

power factor correction

1000 volts and over



An advanced design of High Voltage Capacitor has been developed by *Standard* laboratories to ensure satisfactory operation over a wide range of ambient temperatures.

H.V. Capacitors are manufactured up to a maximum rating of 250 kVAr and higher ratings are assembled by grouping together the required number of units in a manner best suited to site conditions.

Indicating fuses and discharge resistors are standard fittings and are contained in a metal hood which has a transparent panel or ports allowing rapid inspection. Removal of the panel permits replacement of fuses.

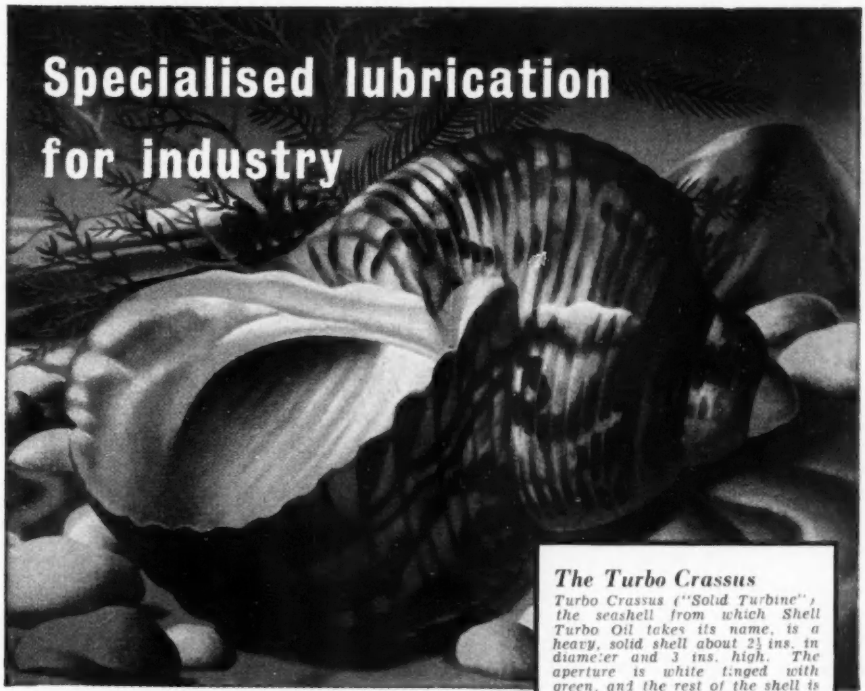
These capacitors are contained in hermetically sealed tanks which are mounted on rollers and fitted with lifting lugs and are suitable for indoor and outdoor operation. Terminations may be made to a cable box or to outdoor bushings as required.

The advice of Standard engineers is available without charge, problems will be investigated and estimates prepared without obligation. Full details of this and other ranges of Standard Power Factor Correction Capacitors may be obtained from :

Standard Telephones and Cables Limited

Registered Office : Connaught House, Aldwych, London, W.C.2.

POWER LINE DIVISION, (Department 2440) NORTH WOOLWICH, LONDON, E.16. Telephone: ALBERT DOCK 1401 (EXT. 796)



The Turbo Crassus

Turbo Crassus ("Solid Turbine"), the seashell from which Shell Turbo Oil takes its name, is a heavy, solid shell about 2½ ins. in diameter and 3 ins. high. The aperture is white tinged with green, and the rest of the shell is dirty white or greenish, with angular black or brown patches on the ribs. Found off the coasts of North Australia and New Caledonia

SHELL TURBO OIL

SHELL TURBO OILS are highly refined oils containing anti-oxidant and anti-rust additives. They separate readily from water during prolonged service and have outstanding oxidation stability. Available in a range of viscosities, they are recommended for steam, gas and water turbines, bearings of high speed enclosed crankcase steam engines, and certain other circulating systems where oils of turbine quality are required. Shell Turbo Oils are approved by all the leading turbine builders.

The wide Seashell range of specialised industrial lubricants is marketed in nearly every country of the world. There is a Seashell grade for *every* industrial use—and each is available everywhere in the same high quality.

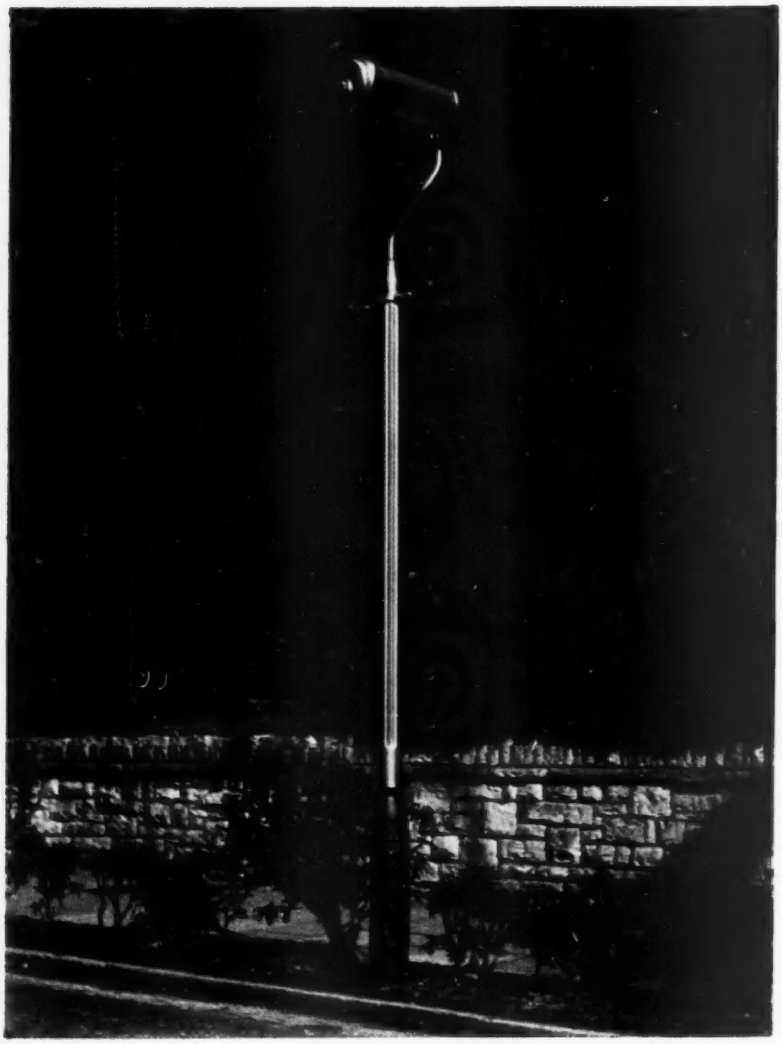
SHELL LEADERSHIP IN LUBRICATION

WORLD-WIDE INDUSTRIAL RESEARCH

Seashell Oils are produced as the result of *world-wide research*. At Shell's great Thornton Research Centre, and at other Shell Research Centres in Europe and America, scientists and technicians spend their lives studying the special lubrication needs of every branch of industry. The rewards of this research are the Seashell oils—each developed to solve a *specialised* lubrication problem. This is the solid basis upon which Shell has built up its world-wide *leadership in lubrication*.

CALL IN A SHELL LUBRICATION ENGINEER

Shell Lubrication Engineers will be pleased to provide further information and to make specific recommendations for particular purposes. You can be sure of Shell lubrication—it is *specialised* lubrication.



TUBULAR STEEL LIGHTING COLUMNS

TYPE Gb. 512, FITTED WITH BRACKET TYPE Gb. 700. M.H. 15 ft.

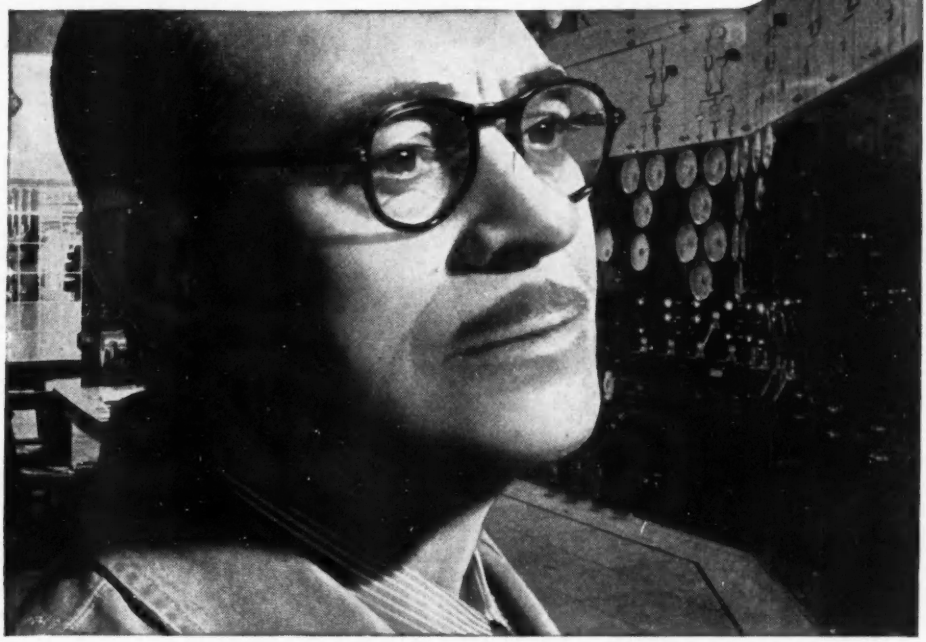
For Group 'B' roads — suitable for electric lighting.

STEWARTS AND LLOYDS LIMITED

GLASGOW · BIRMINGHAM · LONDON

S&L

The people everyone relies on . . .



More than 500 generating and sub-stations can't be wrong—they all rely on Tudor Batteries: Hams Hall A, B, Croydon A, B, Barking A, B, C, Nechells A, B to mention only a few. And every name is a proof of that outstanding reliability which has made Tudor the first choice for so many purposes. The experienced engineering staff of the Tudor Accumulator Co. Ltd., will be pleased to prepare the most economical battery scheme to meet your requirements.

Tudor Batteries for

SWITCH OPERATING

EMERGENCY LIGHTING

TELEPHONE EXCHANGES

ELECTRIC VEHICLES

MARINE

T.112

Rely on Tudor BATTERIES

THE TUDOR ACCUMULATOR COMPANY LTD · 50 GROSVENOR GARDENS · LONDON · SW1

C

CABLE MARKERS

Interlocking Type

The Critchley Interlocking Ferrule is a simple and economical solution to the problem of identifying cable ends where a wide range of markings is required

Leaflet on request

KEYED FOR PERMANENT ALIGNMENT

The patented key ensures that the ferrules can only be assembled with the figures in line and CANNOT COME OUT OF ALIGNMENT AFTERWARDS. Standard colours–Black, White, Red, Blue, Yellow and Green.

CRITCHLEY BROS LTD - BRIMSCOMBE - STROUD

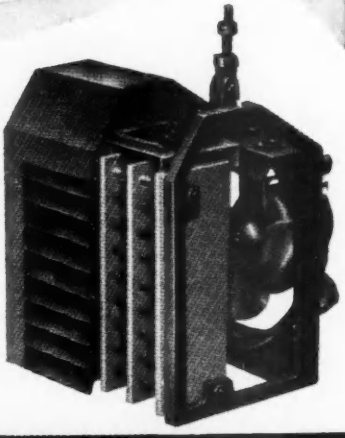
Telephone Brimscombe 2208

B09.9

UNIT HEATERS

Made in 3 sizes 3, 5 and 10 Kw.

- ALL ELECTRIC
- SIMPLE TO INSTAL
- ECONOMICAL TO RUN
- AUTOMATIC CONTROL
- REFRESHING ATMOSPHERE IN SUMMER
- AUGMENTS EXISTING HEATING SYSTEMS
- MINIMUM OF MAINTENANCE



SEND FOR LIST 57

CARTER

C COMPANY (NELSON) LTD.

NELSON LANCASHIRE

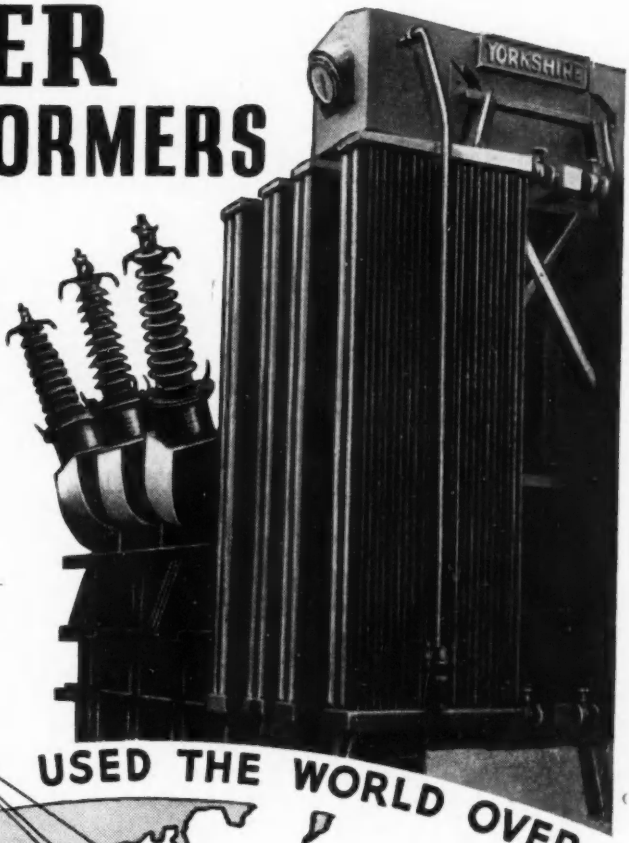
TELEPHONE · 638

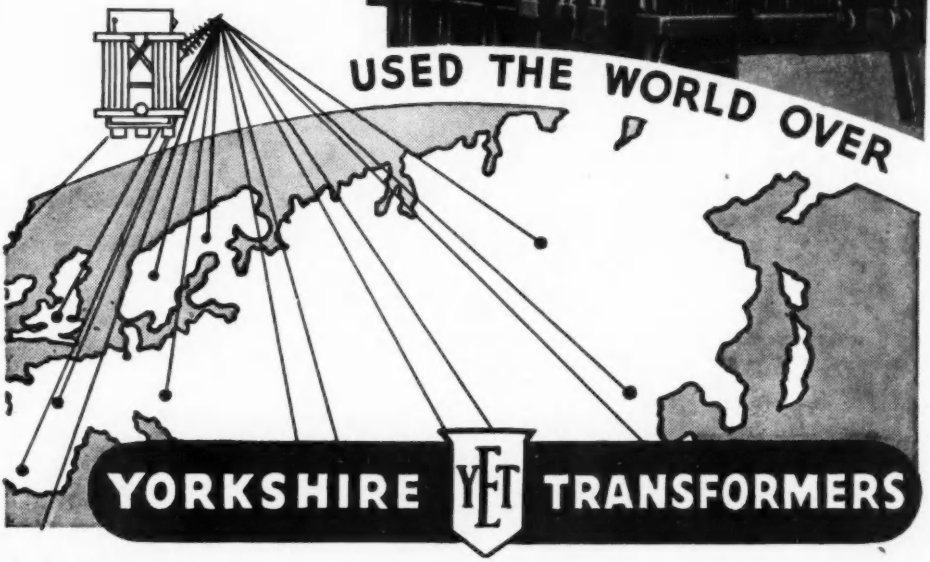
POWER TRANSFORMERS

We are specialists in the manufacture of **POWER TRANSFORMERS** for Generation, Transmission, and Distribution. Every Transformer is entirely manufactured in our own Works.

Ratings up to 45,000 k.V.A.

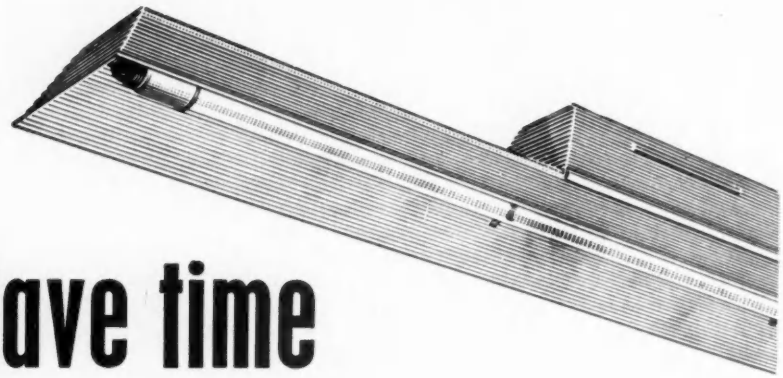
Voltages up to 132,000 volts





YORKSHIRE YET TRANSFORMERS

THORNHILL • DEWSBURY • Phone: Dewsbury 1691/2



Save time save trouble save money

with this popular Mazda fitting

THE MAZDA F.207 all-purpose industrial reflector is a veteran with so many honours that it has achieved a unique position in the lighting world. Basically it is the same fitting that won instant approval when it was introduced several years ago, and recent improvements have only served to increase its already great popularity with architects, consultants and contractors.

The secret of its success lies in the simplicity of its design, the ease and speed with which it can be handled and installed, and its versatility.

Mazda Industrial Reflector (Cat. No. F.207).

All the lamp auxiliary gear is assembled in a separate detachable box and ready-wired to a five-pin plug. The reflector is thus very light and easy to handle and can be placed in position (on chain or conduit) *before* the comparatively heavy gear box is fitted over it and plugged in.

The reflector gives a 20° cut-off from a single 80 Watt fluorescent lamp, and has slots in its upper surface (Cat. No. F.208) for additional upward lighting. It can also be supplied without upward light slots (Cat. No. F.208).

Write for Descriptive List No. 9601-3 which gives full details.

Lighting Engineers of the BTH Lighting Advisory Service will be glad to help you plan any lighting scheme. Their expert service can be freely drawn upon at all times through any BTH Office.

B T-H

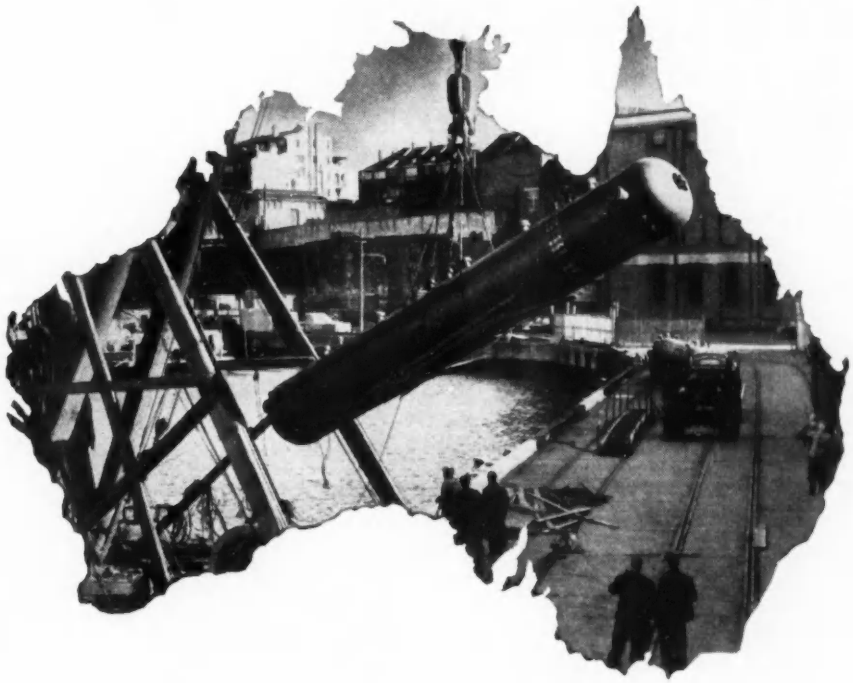
For leadership in lighting

say Mazda

THE BRITISH THOMSON-HOUSTON CO. LTD.
Crown House, Aldwych, London, W.C.2

M.4365

Going up . . .



down under

Steam-raising plant by Simon-Carves is helping to meet Australia's need for more electric power. The photograph shows a solid-forged boiler drum being unshipped in Sydney for the Bunnerong power station extensions, for which Simon-Carves are building two pulverised fuel fired boilers, electrostatic precipitators, coal, ash and dust handling plant, and a reinforced concrete chimney. The new Tallawarra power station in New South Wales is also being equipped with complete steam-raising plant by Simon-Carves

Steam power by **Simon-Carves Ltd** SIMON ENGINEERING GROUP

STOCKPORT ENGLAND

S.C. 24

HAVE YOU AN

Earth Leakage Problem

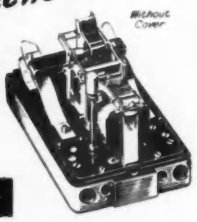
CHILTON

EARTH LEAKAGE CIRCUIT BREAKERS

OTHER MODELS
ELT "B" with thermal and magnetic overload trip up to 30 amps - - - £2 7 6
ELT "B" with thermal and magnetic overload trip over 30 amps - - - £2 17 6

OFFER YOU *POSITIVE PROTECTION* FOR **33/-**

FEATURES
● Capacity: 0 to 60 amps ● Double Pole
● Robust Construction ● Easily Installed
● Corrosion Free ● Free Handle



TYPE ELT "A"

Full information with pleasure from . . .

CHILTON ELECTRIC PRODUCTS LTD.

(Dept. ET2) HUNGERFORD, BERKS. ENGLAND

THOUSANDS have been SOLD . . .

No. 1482

ROUND CORNERED PAVEMENT COVERS AND FRAMES

16 Standard Sizes

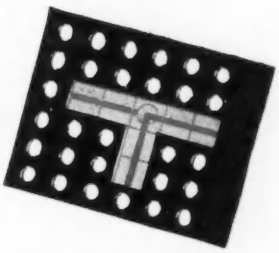
Also makers of:
Roadway Covers and Frames · Lamp Pillars and Brackets · Kiosks and Pillar Casings

ESTABLISHED 1814

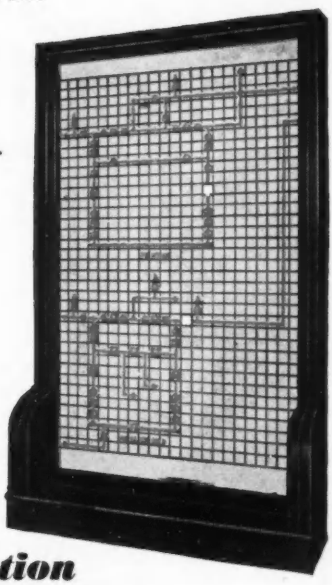
HARDY & PADMORE LTD., WORCESTER. Tel: WORCESTER 3215

M-W.101

MOSAIC DIAGRAMS for *Remote Control Systems*



These ingenious diagrams enable the control engineer to see at a glance the up-to-the-minute condition of the network throughout the whole area under his control. Small interchangeable plastic squares (some bearing appropriately coloured symbols) are mounted on pierced metal panels by means of simple clips, and the diagram so formed can be quickly and easily altered to show changes as they occur in the actual system—such as, for example, the addition of new sub-stations or the re-arrangement of feeders in a power network. This is but one example of the many ways in which A.T.M. Supervisory Remote Indication and Control Equipment can be applied to the needs of industrial, commercial and public utility undertakings.
Further information and illustrated literature will be gladly forwarded on request.



ATM

Supervisory Remote Indication and Control Equipment

AUTOMATIC TELEPHONE & ELECTRIC CO. LTD.

Strowger House, Arundel Street, London, W.C.2

Telegrams : Strowger Estrand London *Telephone :* TEMple Bar 4506

Strowger Works, Liverpool, 7

A4342-C23

TWICE the SELLING power with..

EKCO

DOUBLE-LIFE

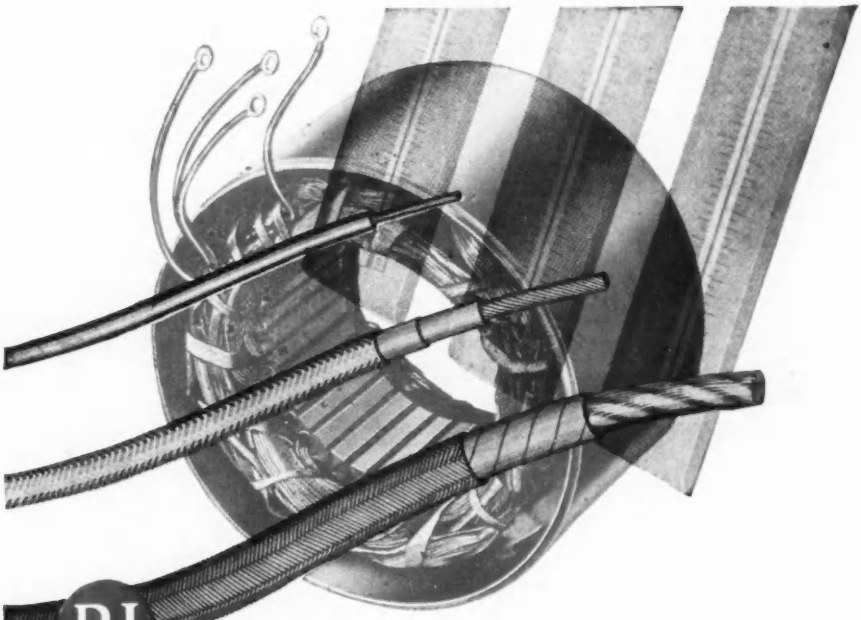
FLUORESCENT LAMPS

THERE'S TWICE THE VALUE in Ekco double-life Fluorescent Lamps —that's why they sell twice as fast! Feature Ekco double-life Fluorescent Lamps and capture the new and replacement business in your area! Quicker turn-over and more customers mean bigger profits and bigger business in other lines, too. *Stock up now* with Ekco double-life Fluorescent Lamps.

SALES OFFICES, ILLUMINATING ENGINEERING DEPTS., SHOWROOMS AND DEPOTS

London 5 Vigo Street, W.1. . Tel. Regent 7030
Cardiff 50 Bridge Street. . . . Tel. Cardiff 5426
Glasgow 26 India Street, C.2. Tel. Central 2012
Preston Kent Street Works . . . . . Tel. Preston 4628
Nottingham 57 Hounds Gate . Tel. Nottingham 45862
Birmingham 40-42 Summer Row, B'ham 3. Tel. Central 2997

EKCO-ENSIGN ELECTRIC LTD.



B.I. Callender's

Coil-End Flexibles

for every Stoving Temperature

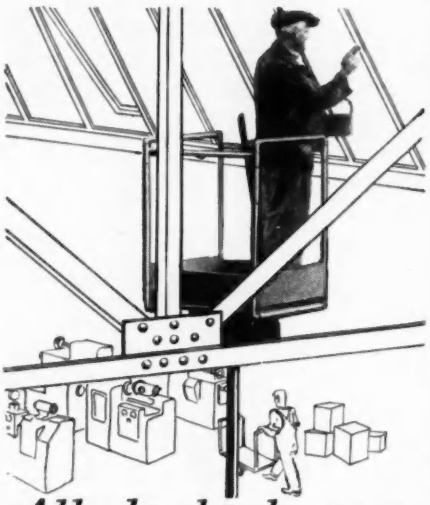
You can forget about the hardening and cracking of Coil-End Flexibles caused by high stoving temperatures and gruelling finishing processes—if you consult BICC.

BICC Coil-End Flexibles are specifically designed to withstand the finishing processes and stoving temperatures to which coils and windings are subjected and still retain their flexibility. They are manufactured for service up to 6,600 volts and can be supplied with many different forms of insulation to suit individual conditions.

If required, expert guidance on the choice of the most suitable insulants for your particular jobs will be given freely by the BICC Technical Advisory Service.

Write for a copy of our Publication No. 294U which gives further details.

BRITISH INSULATED CALLENDER'S CABLES LIMITED
NORFOLK HOUSE, NORFOLK STREET, LONDON, W.C.2



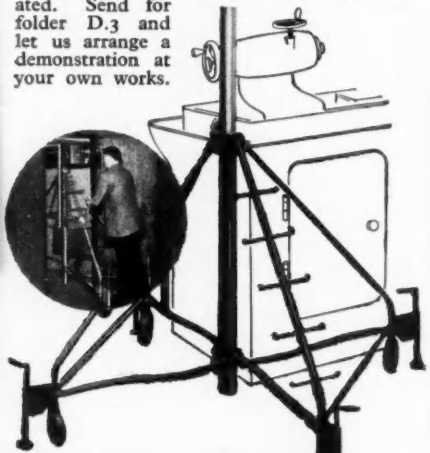
All the high spots
—in a jiffy!

with the

BEANSTALK Regd.

MOBILE HYDRAULIC WORKING PLATFORM

Supersedes timber towers, ladders, trestles, scaffolding. Gives close access to all overhead work—legs span fixed objects. Folds to pass through doorways, narrow gangways and into lifts. Manually or electrically operated. Send for folder D.3 and let us arrange a demonstration at your own works.



WM. MOSS & SONS, LTD.
(Mechanical Developments Division)
North Circular Road, Cricklewood, London, N.W.2
Tel.: GLAdstone 8080

T.H.4270

Build your own equipment with

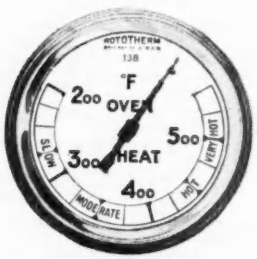
DEXION
SLOTTED ANGLE

★ **Can be used over and over again**

★ **No drilling, measuring or painting**

★ **Just cut it and bolt it, that's all**

DEXION LIMITED
Triumph House, 189 Regent Street, London, W.1.
TELEPHONE REGENT 4841-5



DIAL THERMOMETERS
ACCURATE TEMPERATURE AT A GLANCE

The clear dial, robust construction and high degree of accuracy make this specially designed Oven model the best of its type available. Write for Catalogue "Modern Thermometry" which gives details of models for indicating, controlling and recording temperature.

Rototherm

THE BRITISH ROTOTHERM CO. LTD.
Merton Abbey, London, S.W.19 Phone: LIBerty 3406

'ENGLISH ELECTRIC'

switchgear

'ENGLISH ELECTRIC' pioneered heavy-duty air circuit breakers and consequently have built up an unrivalled field of experience in service.

Designed for indoor operation in power stations and on industrial installations 'ENGLISH ELECTRIC' Type O.B. air circuit breakers are available for medium voltage and 3.3 kV systems.

Illustrated is an O.B.2. air circuit breaker which has a rating of 600 amps. 660 volts and 15 MVA when tested to BS.116. It can be supplied in either single or double tier cubicles with hand or electrical operation.

'ENGLISH ELECTRIC' air circuit breakers have been evolved from more than 40 years experience —they provide safe and consistent operation, low maintenance costs, and reliability under all conditions of service.

The ENGLISH ELECTRIC Company Limited

QUEENS HOUSE, KINGSWAY, LONDON, W.C.2

Switchgear Department, Liverpool

Works: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL

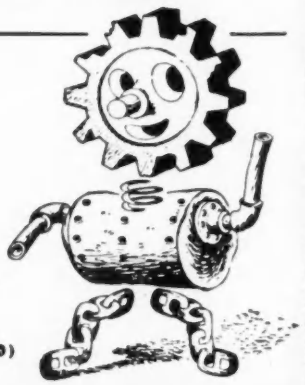
SL.2

WANTED!

NEW STEEL

alias JACK SCRAP

(MAY BE IN HIDING OR DISGUISED)



Bring your detective powers to bear on the search for scrap and you'll probably unearth tons of it disguised as old plant you never use or hidden in out of the way corners of your warehouses, stockrooms and yards.

The new steel every industry needs can be made from the old steel it has done with. Find all you can. Round it up. Turn it in.

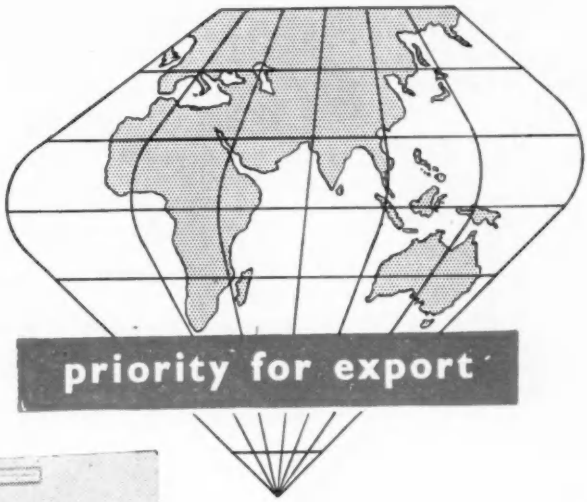
WANTED
from the
ELECTRICAL INDUSTRY
Old engines and transformers and *every kind* of general and process scrap and obsolete plant

Your scrap merchant will help with dismantling and collection.

SPEED THE SCRAP *SPEED THE STEEL*

Issued for the STEEL SCRAP DRIVE by the British Iron and Steel Federation, Steel House, Tothill Street, London, S.W.1

T.44



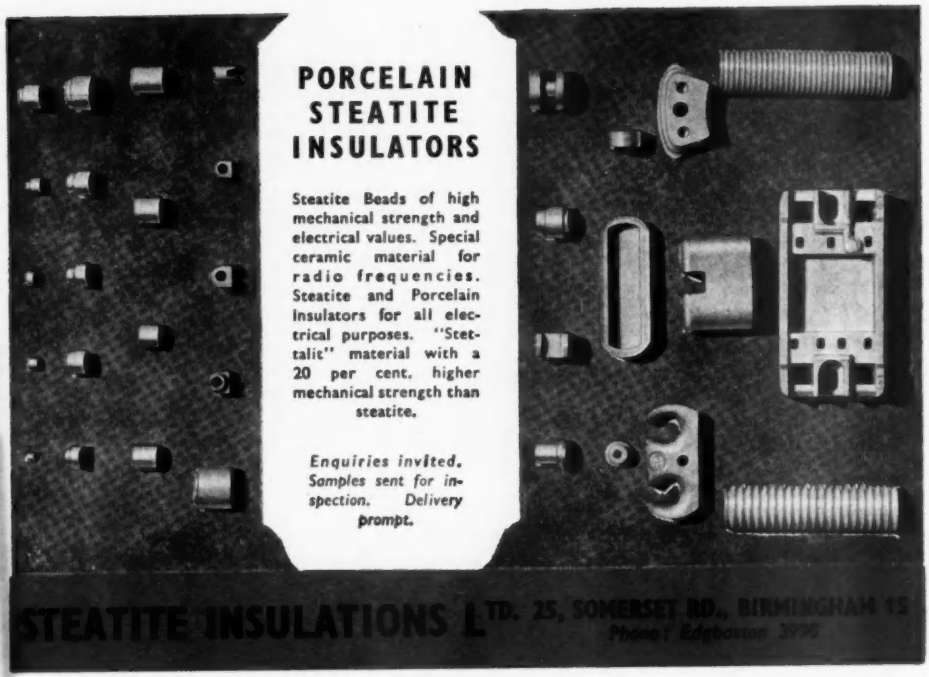
Creda Cookers are in short supply at home because housewives **everywhere** are choosing Creda. Never before has the House of Simplex exported so many of these famous cookers. And never before have these exports been so necessary to the nation's good

Creda comet

electric cookers

made by the House of **Simplex**

Simplex Electric Co Ltd Oldbury Birmingham and Branches A TI COMPANY


PORCELAIN
STEATITE
INSULATORS
Steatite Beads of high mechanical strength and electrical values. Special ceramic material for radio frequencies. Steatite and Porcelain Insulators for all electrical purposes. "Stettalic" material with a 20 per cent. higher mechanical strength than steatite.
Enquiries invited. Samples sent for inspection. Delivery prompt.
STEATITE INSULATIONS LTD. 25, SOMERSET RD., BIRMINGHAM 15
Phone: Edgbaston 3990

SOLONS FOR ESSENTIAL JOBS!

Use SOLONS for the jobs that matter — this modern precision tool makes soldering speedier, simpler and more reliable. 5 models: 65 watt with oval tapered and round pencil bit; 125 watt with oval tapered and round pencil bit; 240 watt with oval tapered bit; each with 6 feet 3-core Henley flexible. Voltage ranges from 100 to 250. Write for folder Y.10.

W. T. HENLEY'S TELEGRAPH WORKS CO. LTD., 51-53, Hatton Garden, London, E.C.1

HENLEY SOLON ELECTRIC TRADE MARK SOLDERING IRONS
FOR INDUSTRIAL USE

"Sieray" lamps with "Sieray" fittings give better light for half the consumption of current. You can choose from a wide range of attractive designs for Office, Store, Factory, etc.

ILLUSTRATED CATALOGUE No. 998 *Sent on application*

Advt. of SIEMENS ELECTRIC LAMPS AND SUPPLIES LIMITED, 38 39 Upper Thames Street, London, E.C.4
Branches at- Belfast, Birmingham, Bristol, Cardiff, Dublin, Glasgow, Leeds, Liverpool, Manchester, Newcastle-on-Tyne, Nottingham, Sheffield.

The New BNE

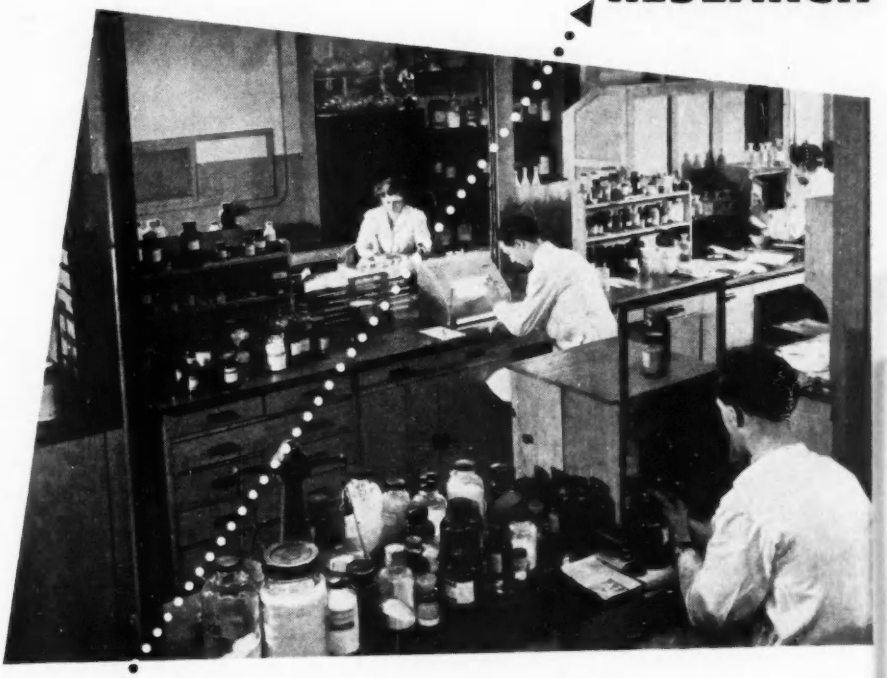
Immersion Heaters and Circulators

★ Conform to B.S. 1556 ★ Are very easy to install ★ Combine the best features of the old 'Highlow' and 'Charlton' ranges.

A BNE Product

BRITISH NATIONAL ELECTRICS LIMITED
The Domestic Appliances Section of JOHNSON & PHILLIPS LTD.
NEWARTHILL · MOTHERWELL · SCOTLAND

RESEARCH



REASONS WHY

ATLAS FLUORESCENT

IS SUPREME

Thorn Electrical scientists, some of the foremost in the industry, have been responsible for the impressive ATLAS developments in fluorescent lighting in these post-war years. Time after time they have been the first in the industry to announce important advances.

In the ATLAS laboratories were developed the first standard 4,500° K 'Daylight' fluorescent lamp; the ATLAS Quickstart unit; ATLAS dimmer controlled fluorescent, the "greatest ever" advance in theatre and display lighting; and ATLAS 'Double-life' lamps, with a guaranteed life of 5,000 hours.

ATLAS "double-life" FLUORESCENT LAMPS

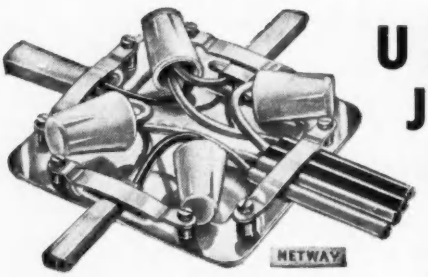
Write for the new Atlas fluorescent lighting handbook, AL/104

THORN ELECTRICAL INDUSTRIES LTD., LIGHTING DIVISION, 233 SHAFTESBURY AVE., LONDON, W.C.2

301

METWAY PRODUCTS

Centre of Attraction!



UNIVERSAL JUNCTION BOX for
Lead covered cables
24/- PER DOZEN
+10% SUBJECT

Strange to say
DELIVERY
FROM STOCK
at the moment!

Please send 6d. stamp for our 92-PAGE LIST No. OH/31/TE

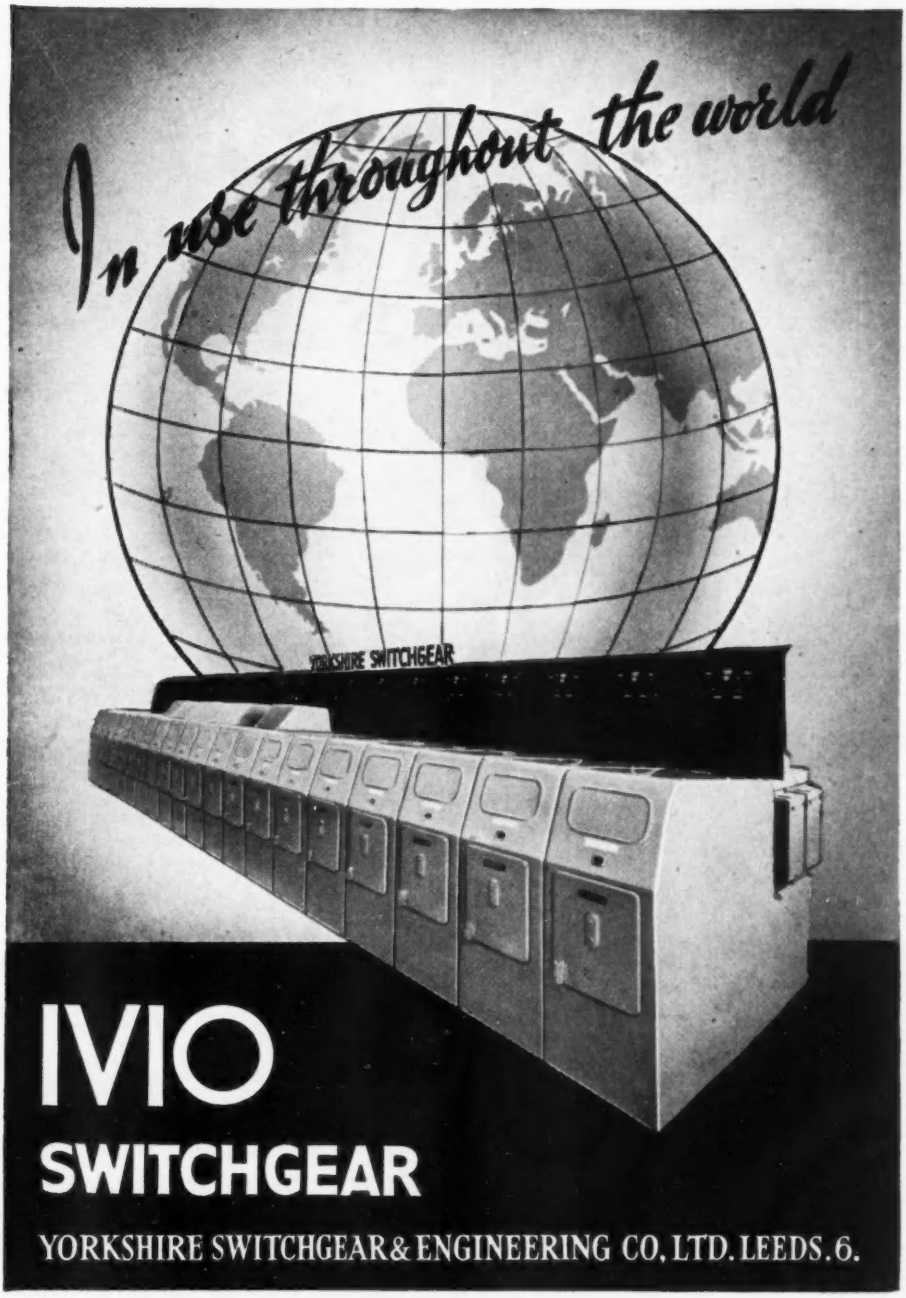
METWAY ELECTRICAL INDUSTRIES LTD.
KING STREET, BRIGHTON 1
Phone: Brighton 28366 Grams: Metway, Phone, Brighton

with confidence, as only OKERIN Waxes are used.

Yours faithfully,
L. Power Factor
A.M.I.E.E.

P.S.
Waxes are small in bulk but
bulk large in importance —
they must be just right for the
job and reliable Specify OKERIN.

Sales Department
ASTOR BOISSELIER & LAWRENCE LTD.
9 SAVOY STREET · STRAND · LONDON · W.C.2
Works and Laboratories · WEST DRAYTON · Middlesex



Also at GRAND BUILDINGS, TRAFALGAR SQUARE, LONDON, W.C.2

SPECIFY PD BRUSHES

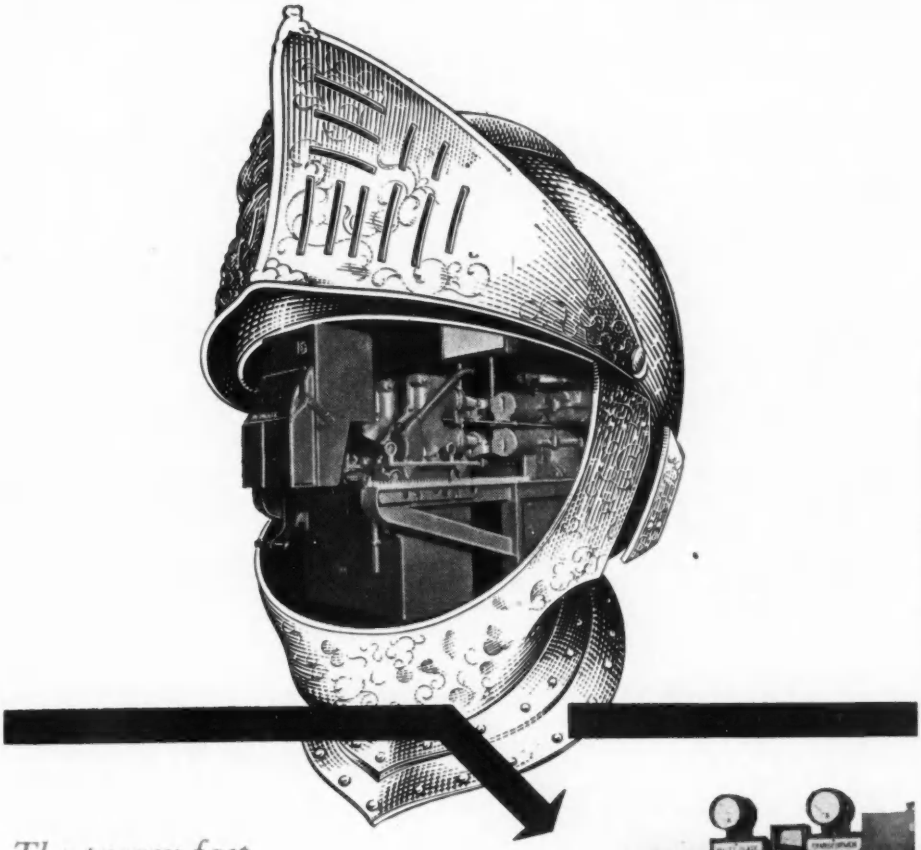
FOR GOOD COMMUTATION. LOW BRUSH WEAR AND LONG LIFE OF COMMUTATORS OR SLIP RINGS.

FULL TECHNICAL LITERATURE ON REQUEST

POWELL DUFFRYN
CARBON PRODUCTS LTD

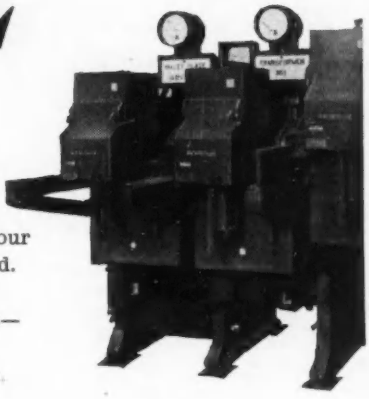
ELECTRICAL CARBONS DIVISION, SPRINGFIELD RD., HAYES, MIDDLESEX

TELEPHONE: HAYES 3994/8 TELEGRAMS: CARBONACES, HAYES.



The proven fact

Whether it's metalclad men or the same kind of switchgear, the fact of reliability proved in the armourer's or the testing shop outweighs all other considerations. With metalclad switchgear, which controls power loosely comparable to that of four million armed men, unreliability is a sad thing indeed. So, with all the efficiency and care we can muster—and after more than half a century that's a whole lot—we make switchgear that has been proved by the most arduous practical tests to be extremely reliable.



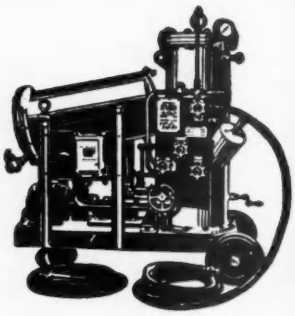
REYROLLE METALCLAD SWITCHGEAR

A. REYROLLE & CO. LTD., HEBBURN, CO. DURHAM.

CRC125

Cold Filtration of Insulating Oils

The insulating value of used transformer and switch oils by one passage through the Metafilter is raised to a higher break-down voltage than the new oil.
The plant is purely mechanical and extremely simple in operation.

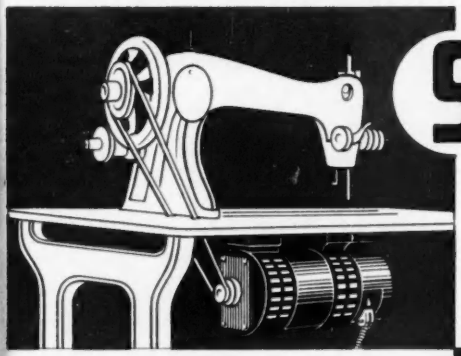


Capacities from 20 gallons to 1,000 gallons per hour.

METAFILTRATION

PHONE HOUNSLOW 1212 3
GRAMS METAFILTER HOUNSLOW

THE METAFILTRATION COMPANY LIMITED, BELGRAVE ROAD, HOUNSLOW, MIDDLESEX



SEW-TRIC

SEWING MACHINE
MOTORS

1/15 H.P. A.C./D.C.

Motor started and controlled by light pressure on foot control pedal, leaving both hands free. No fatigue.

Needle light fitted on motor to relieve eye strain.

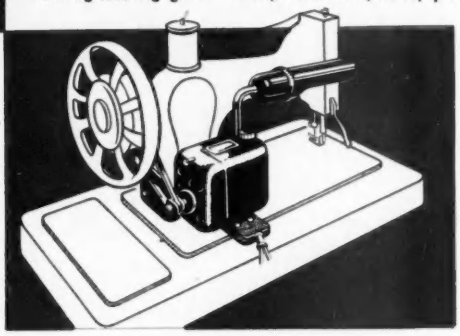
Running cost negligible. Retail price £5 14s. plus 25/4d P.T.

"MONOBLOCK" Trade Sewing Machine Motor.
Entirely new design.

Motor started and controlled by light pressure on treadle. Ferodo brake stops sewing machine instantly when pressure on treadle is released.

Ideal motor for dressmaking, tailoring, glove, hat, fur trades, etc. Low current consumption.

Retail price £8 5s.



SEW-TRIC LTD

Sew-Tric House · Honeypot Lane . Stanmore
MIDDLESEX

Not too thick . . .

Not too thin. . .

85% of the light from a fluorescent lamp is provided by the coating of powder on the inside of the tube, and to get the highest efficiency and lumen maintenance, a critical amount of fluorescent powder is required on the tube. Too little powder will leave clear spaces between the particles and the ultra-violet radiation from the discharge will not be used efficiently; too thick a coating will absorb some of the light generated.

The viscosity of the powder suspension is the main factor affecting this powder weight and checks on coated tubes are taken throughout manufacture to avoid any drift from the desired standard.

Quality control ensures uniform excellence.

The illustration shows a viscosity test on fluorescent powder suspension, using a "Ford cup" and stop watch.

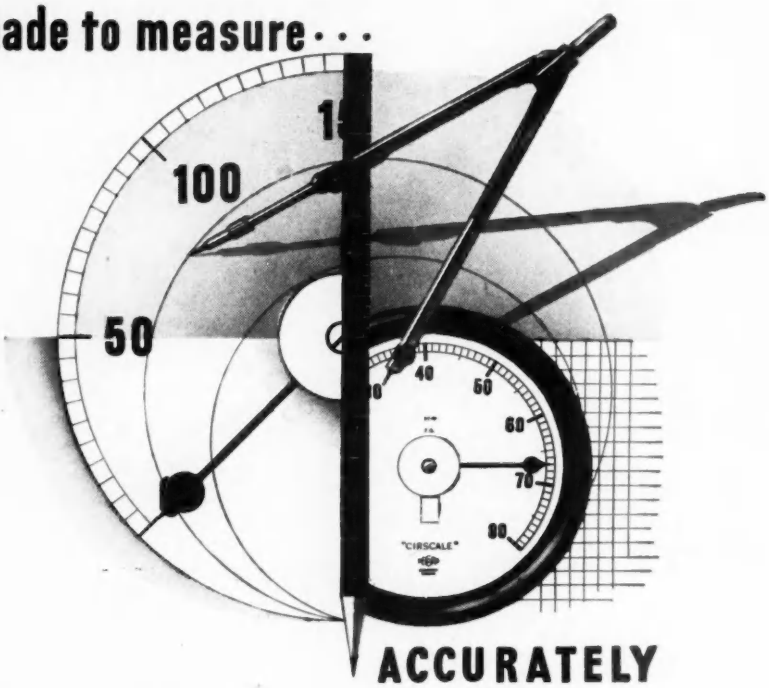
METROVICK LAMPS

Quality control - throughout

METROPOLITAN-VICKERS ELECTRICAL CO. LTD., ST. PAUL'S CORNER, 1-3 ST. PAUL'S CHURCHYARD. LONDON E.C.4
Member of the A.E.I. group of companies

S/F106

made to measure . . .



ACCURATELY

The man who knows exactly what his machine is doing—who has accurate, constant and visual indication of its Consumption; its Speed; its Output, etc. is wise.

But, one who uses a "RECORD" Electrical Measuring Instrument is wisest. It is made to measure—ACCURATELY, by those who were the pioneers of the "CIRSCALE" and who have kept ahead.

RECORD

"RECORD" Instruments include:—
Switchboard Instruments, "Cirscale" Switchboard Instruments, Portable Instruments, Insulation and Resistance Test Sets, Cut-Outs, "Cirscale" Electric Tachometers, Current Transformers, Chart Recorders, Shirley Moisture Meters, Shirley Static Eliminators.

THE RECORD ELECTRICAL COMPANY LIMITED

BROADHEATH · ALTRINCHAM · CHESHIRE

Phone: Altrincham 3221/2/3
London Office: 28 Victoria Street, London S.W.1
Grams: "Cirscale" Sowest, London

Cables and Grams: "Cirscale" Altrincham
Phone: Abbey 5148 and 2783
Cables: "Cirscale" London

BRITMAC

RELIABILITY:
A most important feature for any unit in daily use... Design — Workmanship and Quality of Materials... coupled with rigorous inspection — are factors which contribute to the *high standard* of every 'Britmac' Product.

the points in favour...

ILLUSTRATIONS:
5-amp., Ironclad Watertight Switch Units, Catalogue Numbers P.1600 side handle operation and P.1604 milled disc operation.
Available in 5-amp. and 15-amp. 1-gang, Terminal and Through.

. . . at every point — "BRITMAC"

BRITMAC ELECTRICAL CO. LTD

SALES ORGANISATION OF C. H. PARSONS LTD

HEAD OFFICE · BRITANNIA WORKS · WHARFDALE ROAD · TYSELEY · BIRMINGHAM · 11

Telephone: ACOCKS GREEN 1191 (3 lines) · *Telegrams:* "BRITMAC, BIRMINGHAM"

London Office:
121, VICTORIA ST., S.W.1
Telephone: VICTORIA 9778/9

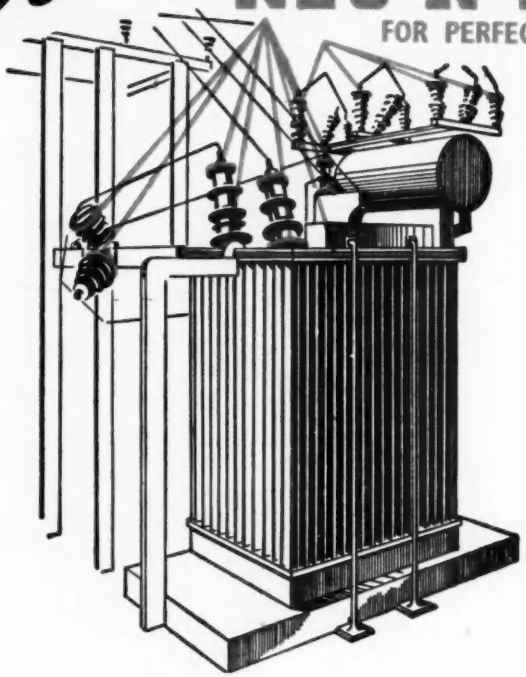
Glasgow Office:
247a, ST. VINCENT ST., &
93, DOUGLAS ST., C.2
Telephone: CENTRAL 3445/6

SM/BE. 496b

A Joint to forget Material to Remember

NEO-K-TEX

FOR PERFECT SEALING



- GASKETS
- WASHERS
- SHEETS
- MOULDINGS

RESISTANT TO OIL, PETROL, WATER AND MOST INDUSTRIAL SOLVENTS

KAUTEX LTD. ELSTREE WAY ELSTREE • HERTS • *Tel.* ELSTREE 1777-8-9

G.E.C. Circulators and Immersion Heaters

OF ALL TYPES

IMMERSION HEATER
Sheathed wire, horizontal mounting.

IMMERSION HEATER
Thermostatically controlled, horizontal mounting.

IMMERSION HEATER
Cartridge type element, vertical mounting.

CIRCULATOR
Thermostatically controlled, vertical mounting.

Consult the . . .

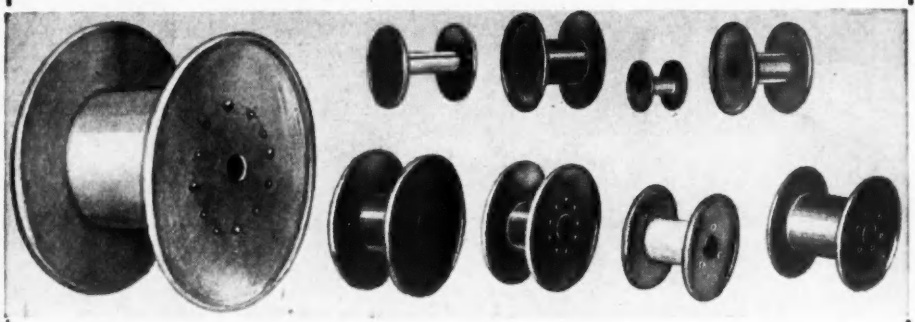
G.E.C.

write for leaflets HO 1245 and HO 1247

THE GENERAL ELECTRIC COMPANY LTD.
MAGNET HOUSE · KINGSWAY · LONDON · W.C.2

REELS LTD.

BYRON STREET : PRESTON : 'PHONE : 3922



Makers of all kinds of wood and steel reels for the electric wire and cable trades.

Our Speciality :—Steel flanges with very strong beaded edges in a wide range of diameters.

Try **REELS LTD.** *for* **R**igid **E**fficient **E**ver-lasting **L**ight **S**trong

All these materials are manufactured by us to the highest standards. Please let us know your requirements, when we will gladly send you full details.

NON-FERROUS METALS
for the ELECTRICAL INDUSTRY

COPPER WIRE
Plain or tinned—for cable making, telephone wire, and strip for engineering purposes. Cotton, paper or asbestos covered—for winding electrical coils of all kinds.

COPPER STRAND
Plain or tinned—for overhead power transmission lines, earthing wire, etc.

COPPER STRIP
Plain or tinned, cotton, paper or asbestos covered—for transformer, electric motor and generator coils, etc.

COPPER or ALUMINIUM BUSBARS

ALUMINIUM CONDUIT TUBING
With plain ends or screwed with couplings.

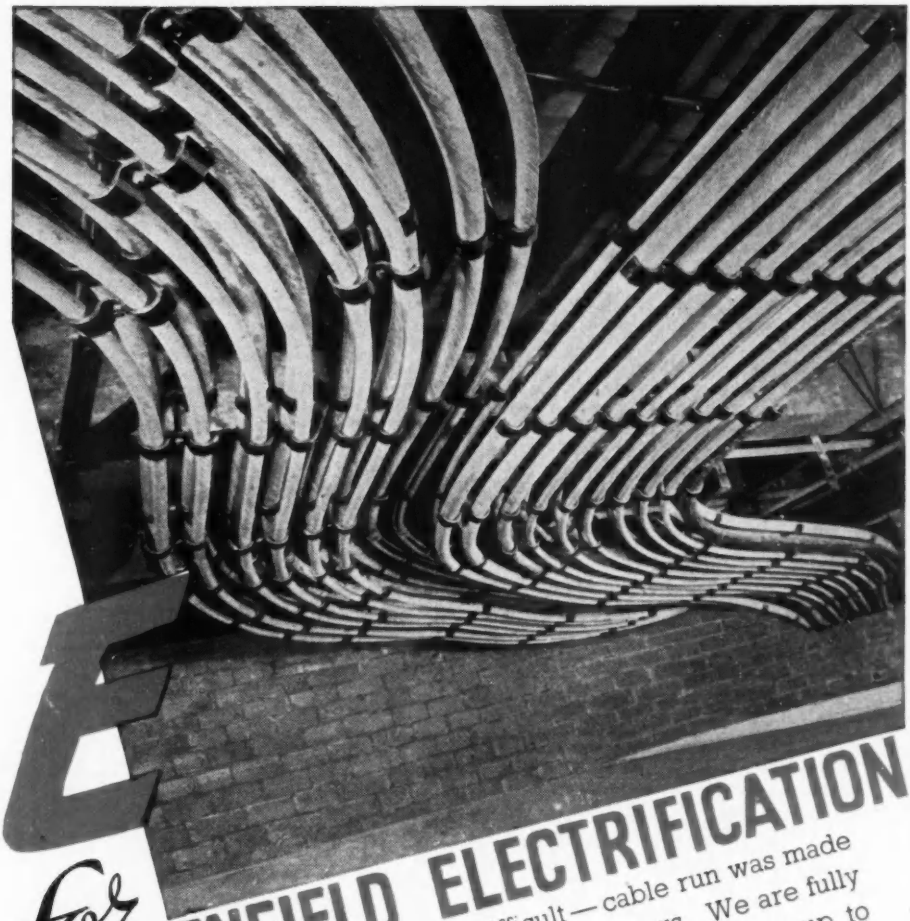
ALUMINIUM ALLOY STRUCTURAL SHAPES
Extruded in various alloys according to purpose in a wide range of angles, channels, and other standard sections, or to special designs.

E. & E. KAYE LTD.

PONDERS END ENFIELD MIDDLESEX

Telephone : Howard 1601 *Telegrams : Cuwire, Enfield*

T.A.3185



E for ENFIELD ELECTRIFICATION

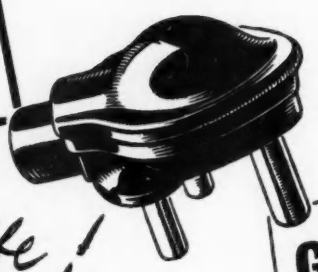
This interesting — and difficult — cable run was made with Enfield cable by Enfield engineers. We are fully equipped to make and install all types of cable up to 275kV. In addition, we design and produce a range of cable joint boxes and other accessories, so making our service complete.

ANY VOLTAGE ALMOST ANYWHERE
ENFIELD CABLES

ENFIELD CABLES LIMITED · BRIMSDOWN · MIDDLESEX
HOWard 2661 (Works) London Office : HOLborn 0591

BELFAST. BIRMINGHAM. BRIGHTON. BRISTOL. CARDIFF. GLASGOW. HULL. IPSWICH. LEEDS. LUTON. MANCHESTER. NEWCASTLE. NOTTINGHAM. PLYMOUTH. SELBY. SOUTHAMPTON. STOKE AND THROUGHOUT THE WORLD.

CLIX



A Plug's Life!

GENACCO

Just a plug, but every day of its life it gets pushed and pulled about, dropped on the floor, trodden on, kicked and banged, and all the time it goes on quietly and efficiently doing the job it was made to do. Its design and construction are simple and robust, combining high technical efficiency with plain common sense. Like every other CLIX product, it is designed to do a job—and do it well.

★ CLIX "Flexipin" plugs ensure the highest attainable contact efficiency, the shortest wiring-up time, effective cord-gripping, and easy insertion into and withdrawal from socket-outlets. The range covers 2, 5 and 15 A., 2- and 3-pin B.S.

GAC CLIX

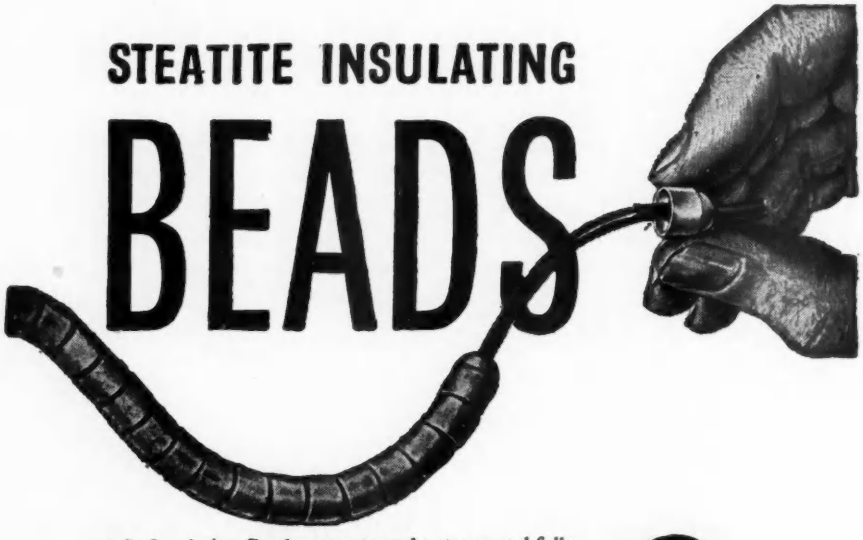
THE GENERAL ACCESSORIES CO. LTD.

Makers of good electrical accessories since 1896

BARTON HILL WORKS · BRISTOL, 5

STEATITE INSULATING

BEADS



S.P. Insulating Beads are extremely strong and fully vitrified, yet very low in price. They are now available from stock. Sizes for wire 4-18 S.W.G.

STEATITE & PORCELAIN PRODUCTS LTD.

Stourport-on-Severn. Tel: Stourport 111. Grams: Steatain, Stourport

S.P.41

MINERVA
ELECTRICAL INSULATING VARNISHES

STOVING VARNISHES
(Natural Resin Type)

STOVING VARNISHES
(Synthetic Resin Type)

THERMO-SETTING VARNISHES

AIR-DRYING VARNISHES

CLOTH VARNISHES

CORE-PLATE VARNISHES
(Stoving and Air-Drying)

COPPER-WIRE ENAMELS
(Oleo-resinous and Synthetic Types)

All the above are supplied in black and clear

ACID & HEAT RESISTING ENAMELS
Available in all colours

MICA BONDING VARNISHES

COIL STICKING VARNISHES

SLEEVING VARNISHES
(Black, Clear and Colours)

CABLE LACQUERS
(Non-flam., Cellulose Type and P.V.C.)

COMPOUNDS Various types

All the materials listed conform to B.S. Specifications wherever applicable.

Our Insulating Varnish Department includes research and testing laboratories: the service of specialists is available to any manufacturer or engineer concerned with problems of insulating materials and their application.

PINCHIN JOHNSON & CO.

4 CARLTON GARDENS, LONDON, S.W.1 Telephone: TRAfalgar 5600

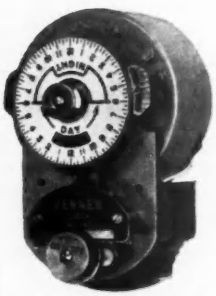
SPOTLIGHT ON POWER CUTS

VENNER INTRODUCE NEW TIME SWITCH WITH 8 HOUR SPRING RESERVE

SMALL, COMPACT, FITS INTO ANY STREET LIGHTING COLUMN

ENTIRELY AUTOMATIC & INDEPENDENT OF MAINS SHUT-DOWNS, NEW T.J.S.P. ELIMINATES NEED & LABOUR COSTS OF CONSTANT RE-SETTING

- ★ Variations in frequency and voltage do not affect timekeeping.
- ★ Large and newly designed cam operated solar dial gives accurate setting to true solar time.
- ★ Automatic synchronous motor winding mechanism maintains minimum reserve of 8 hours—ample cover for all normal power cuts.
- ★ Single pole metal air-break contacts, rated at 20 amps. up to 250 volts A.C.
- ★ Plug-in design. Switch unit may be removed and replaced on site without disturbing wiring or dustproof box.
- ★ New T.J.S.P. Switch particularly suitable, by Authorities concerned, for peak period cut-off of immersion heaters and other high wattage equipment.
- ★ **AND COSTING ONLY £9.15.0!**



Size: $4\frac{3}{16}$ in. wide, $4\frac{3}{16}$ in. deep, 7 in. high, including cast metal dustproof case with top hinged loose lid. Box has bushed holes at the bottom for cable entry. Other boxes of weatherproof design for mounting on the top of poles, clamping to poles, wall mounting, etc., also available.

★ This new switch is the culminating point of Venners 50 years of Horological experience.

VENNER

T.J.S.P. SWITCH

Write for leaflet TS 27/ET

VENNER TIME SWITCHES LTD., KINGSTON BY-PASS, NEW MALDEN, SURREY

Telephone: MALden 2442 (6 lines)

'It's time you switched to VENNER'

ELECTRICAL TIMES

SIXTY-FIRST YEAR OF PUBLICATION

Vol. 120, No. 3135 THURSDAY, 6 DECEMBER, 1951

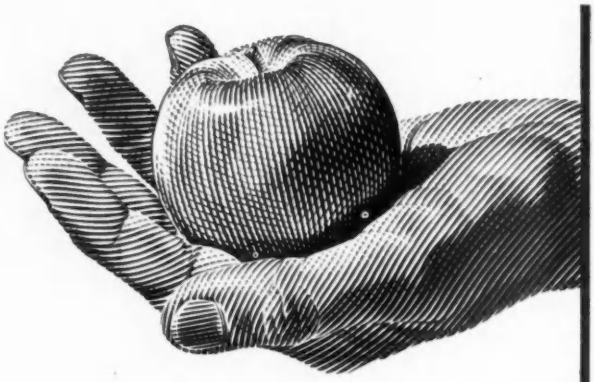
PUBLISHED EVERY THURSDAY

CAPACITOR MOTOR DESIGN, *by P. V. Rao, M.Sc.* 1015
OUR READERS' VIEWS 1019
PROGRESS IN NEW ZEALAND 1021
RIVER ERNE EXPLOITATION 1023
PROBLEMS AND PRACTICE IN ENGINEERING 1024
H.V. SYSTEM REGULATION, *by J. Boggis, A.M.I.E.E., G.I.Mech.E.* 1025
WIRED BROADCASTING 1028
SUBURBAN TRANSPORT IN CANADA 1030
THE SMITHFIELD SHOW 1032
AUTOMATIC BOILER CONTROL 1034
THE STATISTICS OF SUPPLY 1035
BRITISH STANDARDS 1036
MINIATURE CIRCUIT-BREAKERS 1037
OVERSEAS NEWS 1038
PERSONALITIES IN THE INDUSTRY 1040
THE BUYER'S COLUMN 1043
REMOTE MEASUREMENT 1044
NEW LITERATURE 1045
EQUIPMENT FOR ELECTRIC TRAINS 1045
THE WEEK IN NEWS 1046
Questions in Parliament 1050
Electric Supply News 1052
Company Activities 1053
COMMERCIAL INFORMATION 1054
CLASSIFIED ADVERTISEMENTS 65
INDEX TO ADVERTISERS 74

SUBSCRIPTION RATES.—United Kingdom and Overseas £2 10s. 0d. per annum. Canada C$7·50c., U.S.A. $7·50c. per annum. Subscriptions are payable in advance and may commence with any issue throughout the year. Overseas subscriptions may be paid to The Electrical Times Limited by banker's draft, cheque or international money order. Single copies 9d. each.

OFFICES — SARDINIA HOUSE, SARDINIA STREET, LONDON, W.C.2
Telephone - HOLborn 6016 Telegrams - Equivolt, Estrand, London

Pick of the bunch



It is easy to pick out the best fruit. The quality of electric lamps, however, is not so obvious. They all look alike. But you will always be right to stock and use Osram. They are made by the G.E.C., the largest British electrical manufacturing organisation. All the vast technical resources and practical experience of this great firm are intimately associated with Osram lamps at every stage of manufacture.

Osram

the wonderful lamp

A G.E.C. PRODUCT

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

Editorial

LIMITED EXPANSION

SATURATION of electricity demand is a warning often raised during the history of electricity supply expansion: the feeling is hard to shake off that the increase in units consumed cannot continue to rise at the present rate. "Common sense" is the usual unreliable guide for such predictions, but there was a more rational basis for the statement made by a Ministry of Fuel and Power official who spoke at the I.E.E. last week. His thesis suggested that the most stable parameter in this country, so far as energy sources are concerned, is the rate of increase in the total use of fuel of all kinds, a figure that for many years has stood at a compound interest rate of 3% per annum. Electricity consumption with its far higher rate of increase, at present some 9% per annum, is but one component of this overall fuel figure, but it has become of such magnitude that, if its present expansion continues unabated, the rate of increase of the larger group must perforce rise above 3%. In the speaker's considered opinion, this is unlikely, and he strongly suggests that the overall figure will prevail. It would be interesting to hear the point argued further, for present appeals for increased productivity do seem to imply that no slowing down in expansion of units consumed is to be expected.

EUROPEAN PLANNING

EMPHASIS is given to this expectancy of a continued high rate of growth of electrical energy used by the 25% increase in overall industrial production required of Western European countries over the next five years by current plans of the Organisation for European Economic Co-operation. For Great Britain, with full employment a feature of most of industry, this means greater productivity; and productivity has been well demonstrated to connote increased application of electric power. It is fully recognised that the possibility of supplying the required units involves in turn the availablity of steel for necessary new plant and coal for generation. As a consequence this country has a marked interest in reports on policy and possibilities in all three fields which are to be considered by the Council of the Organisation this month, the reports having been drawn up by working parties composed of senior representatives of member governments. At the back of this energy problem lies O.E.E.C.'s responsibility as arbiter in matters relating to balance of payment considerations and to coal imported from America. Also relevant are the interests of the North Atlantic Treaty Organisation of which Mr. Eden spoke in the House of Commons on Monday. While the extent of Britain's integration with continental Europe remains uncertain, the decisions taken by the O.E.E.C. will undoubtedly have a direct effect on supply industry planning here.

ILL-STARRED ACT

CONCEIVED solely as a means of repairing a chink in the legal armour of the supply industry, the Electricity Supply (Meters) Act, 1936, has had a most chequered history. Many will recall the apprehension caused by the need to set up, all at one time, a number of testing stations to approved standards and the resulting strain on manufacturers and the N.P.L. Right from the start, therefore, the Appointed Day for meter certification had to be postponed and even for some months later meter examiners had to keep a broad mind on the interpretation of the Regulations. The Act also provides that all meters on circuit shall be deemed certified during a period of ten years. The period for these so-called Transitional Provisions was extended to fifteen years in the 1947 Act, and last week a Bill was laid before the House providing a further extension of five years. It may seem paradoxical that a meter which in depreciation is written off in fifteen years should be

deemed accurate for as long as twenty years, and perhaps more. The truth is the 1936 Act was never popular with many undertakings, and although there was an inevitable hold-up during the war years, the work of changing meters on circuit was never pressed as assiduously as it might have been. Consequently certain areas would have found it difficult to complete their programme by 1953. One cannot help feeling, however, that the major reason for the present extension is to slow up this work in view of the present limit on capital expenditure. From that point of view the present step is unquestionably right, but we hope the work will not be stopped entirely, for there are still some indomitable veterans on circuit which might enrich a museum.

FIGURES IN ORDER

WAR-TIME difficulties, especially the enhanced importance of speed in development and production, brought statistical methods forcibly to the attention of engineers, notably in the now familiar inspection procedure of quality control. Extended familiarity showed that there were wider possibilities of application, especially if use was made of the analytical techniques that biologists had developed for handling masses of experimental data, and a few pioneers have demonstrated strikingly that investigational work could be much reduced when such systematic procedures were applied. Last week's I.E.E. Supply Section paper shows how the method has been developed in its application to electricity supply: the question, when considering the dozen and a half examples presented in the paper, becomes, not should statistical methods be used, but rather, how shall they be applied? And it was on this decision that the weight of the discussion rested. Essentially the prevailing spirit was one of caution, not only from the naturally conservative engineers, but also from professional statisticians. As with so many sciences, an appreciation of basic principles is necessary for the most effective use of statistical techniques; subtle pitfalls abound, and the engineer with a little learning on the subject must beware lest he too readily assume that the methods he knows can be applied to his particular problem. But the importance of statistics is assured, and accepted as a valuable guide to planning and a useful tool in the organisation of experiments. Perhaps the answer is that some men with an engineering training and mathematical ability should make a special study of the subject.

ENTOMOLOGICAL SOLICITUDE

ELECTRICITY is surely a word which to the insect world must strike terror to their very antennae. Through generations upon generations, these arthropods have seen electricity grow from amber childhood, through galvanic youth to become a potential menace. Even in the first issues of the ELECTRICAL TIMES they read of a stupendous fly electrocutor designed to kill all insects that should happen upon the deadly cage and dispose their dead bodies in neat array on the dining table, much to the joy of the Victorian housewife. From then on, scarcely a decade went past without some new death-dealing device of devilish cunning. But now a more subtle note appears. In an era of joint consultation, staff canteens and incentive schemes, such conditions will not do; the insects must be coaxed gently to the lethal area and dealt with by approved R.S.P.C.I. methods. Here, at least, electric light has a monopoly, for it is well known that moths in particular respond readily to approved standards of illumination. But subtlety on subtlety, it has now been found that the response of moths is much greater to light in the ultra violet region, and it is reported that by the use of a mercury vapour lamp no less than 25,000 moths were caught in one night. Rightly, entomologists have become alarmed at this carnage of insects which eat our vegetables and destroy our fruit, and nobly has the inventor responded by placing his invention in the official custody of the Natural History Museum. So is preserved our noble tradition of kindness to animals, and no more will moths suffer from sleepless days for fear of electric light.

Meteor

CAPACITOR MOTOR DESIGN

Effect on performance of arranging the stator windings out of quadrature

By P. V. RAO, M.Sc.
Indian Institute of Science, Bangalore

THIS article studies the effect on cost and performance of designing the single-phase capacitor motor with stator windings not in quadrature. The equations of performance are set up by dyadic analysis, following which a typical design of motor is treated as regards both its starting and its running characteristics. The effect of varying the capacitor is also considered, and it is concluded that it is definitely advantageous to design the motor with its stator windings out of quadrature to some ideal value of displacement.

Introduction

Although the theory of the capacitor motor has been the subject of intensive study by various investigators, apparently only Puchstein and Lloyd (1935)[1] and Lyon and Kingsley (1936)[2] indicated any method of analysis for this condition. In his studies on dyadic circuit analysis,[3] Dr. A. P. T. Sah developed an elegant method of deriving the performance of any split phase asymmetrical motor; his results agree with those of Morrill and others. Sah's method is used here to show the effect of varying the angle on the performance of the motor. It is well known that if the angle differs from 90° the motor behaves differently when run in opposite directions.

Theory

The following method is derived from Sah's treatment. The general equations of any induction motor are:—

$$V = Z_{11}I_1 + Z_{12}I_2;\ 0 = Z_{21}I_1 + Z_{22}I_2 \ldots . (1)$$

where V is the impressed voltage vector,

I_1, I_2 are stator and rotor current vectors,

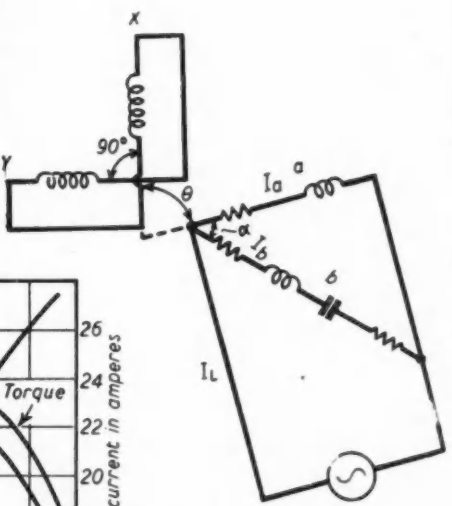
Z_{11}, Z_{22} are self-impedance dyadics, and

Z_{12}, Z_{21} are mutual-impedance dyadics.

Solving for I_1,

$$V = (Z_{11} - Z_{12}Z_{22}^{-1}Z_{21})I_1 = ZI_1 \ldots . (2)$$

and I_2 can then be obtained from the second of equations (1).



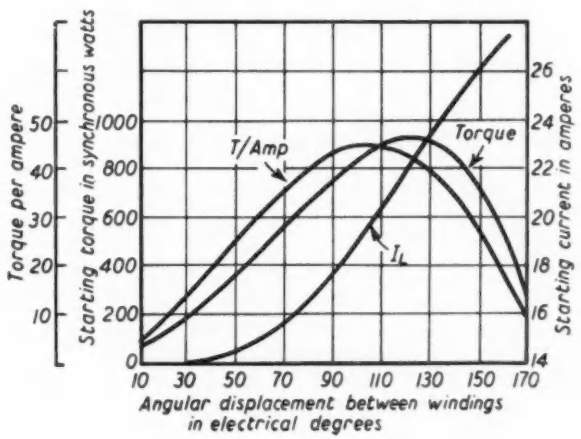
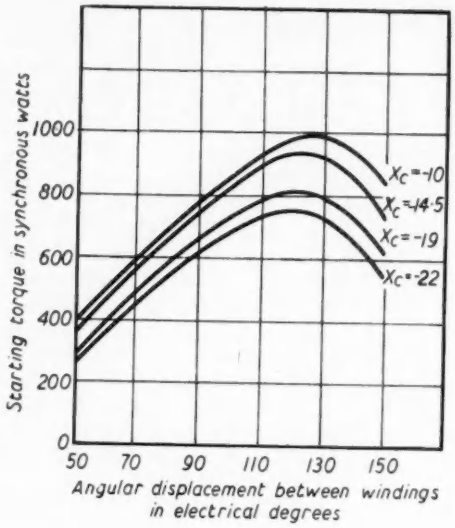
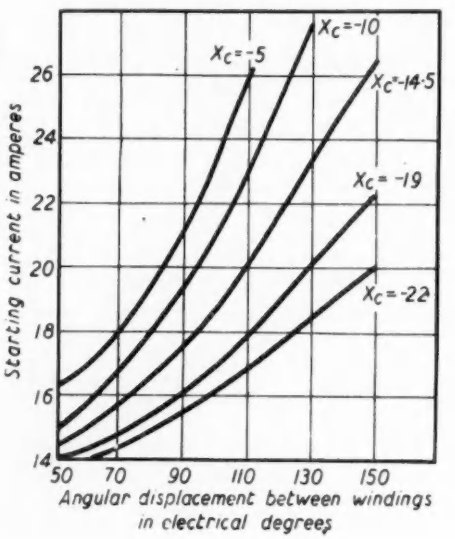


Fig. 1, above, refers to the relative positions of the various windings of a capacitor motor, while the curves in Fig. 2 on the left illustrate starting performance of a motor with the constants given in the article

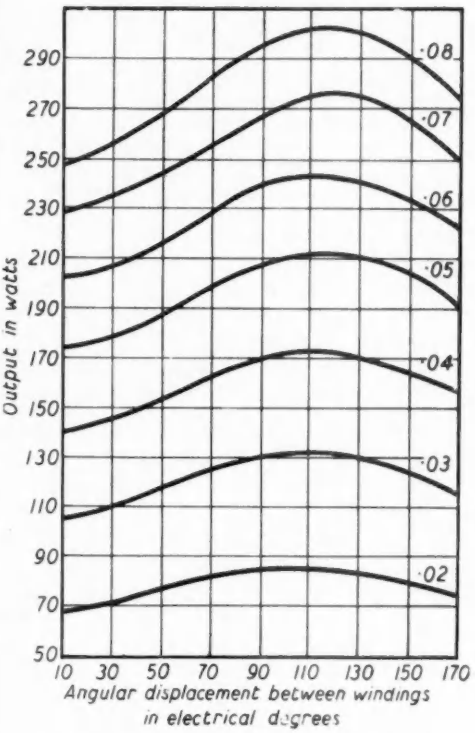


The two curves on the left-hand side of this page refer to the effects of varying the capacitance of the motor. Fig. 3 above shows its effect on the torque-displacement curve, and Fig. 4, below, the reaction on the starting current. The optimum value of the angular displacement is not greatly affected by the change in capacitance. Fig. 5, on the right, together with the two facing curves, detail running performance in terms of various parameters. The fractional figures denote slip



Assume for simplicity a two-phase rotor, so that the impedance dyadic is uniplanar with voltage and current vectors. Sah has shown the validity of this assumption. Fig. 1 shows the relative positions of the various windings. The main winding a leads the auxiliary winding b by the constant angle α, while the rotor windings (mutually at right angles) lead winding a by the varying angle θ. If t is the time and ω the angular velocity of the rotor, $\theta=\omega t$. Let

R_a, R_b = resistances of main and auxiliary windings respectively,



L_a, L_b = self inductances of main and auxiliary windings respectively,

M_{ab} = mutual inductance between a and b,

R_x, L_x = resistance and self inductance of each rotor winding,

M = mutual inductance between each rotor winding and a,

n = turns ratio of main and auxiliary windings, and

p = operator d/dt. Then,

$$Z_{11}=\begin{bmatrix} R_a+pL_a, & pM_{ab} \\ pM_{ab}, & R_b+pL_b \end{bmatrix} \quad \ldots\ldots\ldots (3)$$

$$Z_{22}=\begin{bmatrix} R_x+pL_x, & 0 \\ 0 & R_x+pL_x \end{bmatrix} \quad \ldots\ldots\ldots (4)$$

$$Z_{12}=\begin{bmatrix}\cos\theta, & -\sin\theta\\ n\cos(\theta+\alpha), & -n\sin(\theta+\alpha)\end{bmatrix} \quad \ldots\ldots(5)$$

$$Z_{21}=\begin{bmatrix}\cos\theta, & n\cos(\theta+\alpha)\\ -\sin\theta, & -n\sin(\theta+\alpha)\end{bmatrix} \quad \ldots\ldots(6)$$

Z may now be found from equation (2).

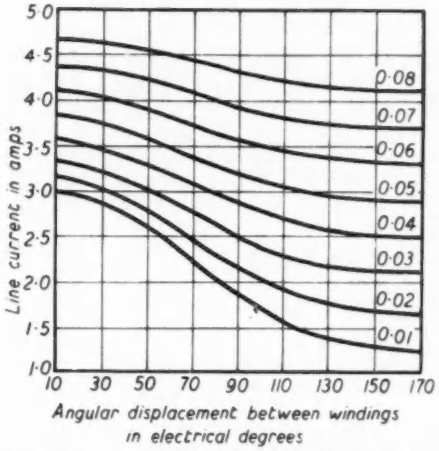


Fig. 6. Running performance: showing the line current at various values of slip

Note that in equations (5) and (6) p operates on θ as well as on the currents. If the circular functions are replaced by their corresponding exponentials, they can be moved to the left of p by the "shifting theorem"; for example,

$$\frac{p\,e^{j\omega t}}{R_x+pL_x}=e^{j\omega t}\,q, \text{ where } q=\frac{p+j\omega}{R_x+(p+j\omega)L_x}$$

Similarly for $e^{-j\omega t}\,q^*$, where q^* is the complex conjugate of q. Then Z =

$$\begin{bmatrix}Z_a+\frac{1}{2}M^2p(q+q^*), & X_{ab}-\frac{1}{2}nM^2p(e^{-j\alpha}q+e^{j\alpha}q^*)\\ X_{ab}-\frac{1}{2}nM^2p(e^{j\alpha}q+e^{-j\alpha}q^*), & Z_b-\frac{1}{2}n^2M^2p(q+q^*)\end{bmatrix} \quad \ldots\ldots(7)$$

Steady State

For steady state running, p is replaced by $j\omega_1$, where ω_1 is the supply frequency in radians per second, so that $\omega=\omega_1(1-s)$, where s is the fractional slip, and $\omega+\omega_1=\omega_1(2-s)$. Then,

$$Z=\begin{bmatrix}A & C\\ B & D\end{bmatrix} \text{ where}$$

$$A=R_a+jX_a+\tfrac{1}{2}X_m^2[s(R_x+jsX_x)^{-1}+(2-s)\{R_x+j(2-s)X_x\}^{-1}]$$

$$B=jnX_m(e^{j\alpha}+e^{-j\alpha})/\sqrt{2}+\tfrac{1}{2}nX_m^2[se^{j\alpha}(R_x+jsX_x)^{-1}+(2-s)e^{-j\alpha}\{R_x+j(2-s)X_x\}^{-1}]$$

$$C=jnX_m(e^{j\alpha}+e^{-j\alpha})/\sqrt{2}+\tfrac{1}{2}nX_m^2[se^{-j\alpha}(R_x+jsX_x)^{-1}+(2-s)e^{j\alpha}\{R_x+j(2-s)X_x\}^{-1}]$$

$$D=R_b+jX_b+\tfrac{1}{2}n^2X_m^2[s(R_x+jsX_x)^{-1}+(2-s)\{R_x+j(2-s)X_x\}^{-1}] \quad \ldots\ldots(8)$$

Thus, $V=AI_a+CI_b=BI_a+DI_b$ and

$$I_a=V(D-C)/(AD-BC) \quad \ldots\ldots(9)$$

$$I_b=V(A-B)/(AD-BC)$$

The line current $I_L=I_a+I_b$.

To obtain the torque it is necessary to know the current magnitudes. Equations (8) show that the rotor current can be resolved into two components, one of slip frequency called the forward component I_f, and the other of frequency (2 − s) called the backward component I_{bb}. They are given by

$$I_f^2=\tfrac{1}{4}K_f(I_a^2+n^2I_b^2+2nI_aI_b\cos(\varphi-\alpha)) \quad \ldots(10)$$

$$I_{bb}^2=\tfrac{1}{4}K_b(I_a^2+n^2I_b^2+2nI_aI_b\cos(\varphi+\alpha)) \quad \ldots(11)$$

where $K_f=\dfrac{2X_m^2}{(R_x/s)^2+X_x^2}$, $K_b=\dfrac{2X_m^2}{[R_x/(2-s)]^2+X_x^2}$

and φ is the angle I_a lags behind I_b. Then the steady state torque in synchronous watts is

$$T=R_xI_f^2/s-R_xI_{bb}^2/(2-s) \quad \ldots\ldots(12)$$

At standstill this becomes

$$T_o=K_oI_aI_b\sin\varphi\sin\alpha \quad \ldots\ldots(13)$$

where $K_o=\dfrac{2nR_xX_m^2}{R_x^2+X_x^2}$

The output is [T(1 − s) − F] watts, where F is the windage and friction watts loss.

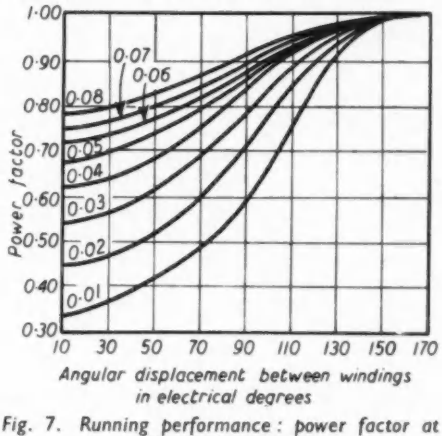


Fig. 7. Running performance: power factor at various values of slip

One might expect from equation (13) that T_o would be a maximum at $\alpha=90°$, but this is not so, because I_a, I_b and φ all depend on α.

Starting Performance

The machine constants of the motor chosen are:

$R_a=2{\cdot}02$, $R_x=2{\cdot}06$, $X_a=69{\cdot}59$, $X_x=34{\cdot}46$, $X_m/\sqrt{2}=33{\cdot}4$, $R_b=7{\cdot}1$, $R_c=3{\cdot}0$, $X_b=96{\cdot}2$, $X_c=-14{\cdot}5$, $n=1{\cdot}18$, $V=110$.

For these values the torque, line current and torque/ampere were calculated for various values of α, the angular displacement between windings, and the results are shown in Fig. 2.

The highest value of starting torque is obtained at $\alpha=120°$ and the highest value of torque/ampere at $\alpha=110°$. The increase in starting torque obtained by displacing the auxiliary winding 120° instead of 90° is approximately 25%. As shown in the Appendix, the maxima are obtainable by differentiation; in this case they are $\alpha=115°\ 30'$ for torque, and $\alpha=111°$ for torque/ampere.

Effect of Varying Capacitance

It might be thought that the value of capacitor used would affect the optimum value of angular displacement. Therefore, four values of capacity were assumed and the calculations repeated for each value. The effect on the torque-displacement curve is shown in Fig. 3, and the effect on the starting current in Fig. 4. The optimum value of α is not greatly affected by the capacitor value. Furthermore, the optimum value of capacity is the same for 90° displacement as for the optimum displacement.

The interesting result from the design point of view is this: when the motor is designed for optimum angular displacement, the capacitor can be reduced in rating to 66% of its value

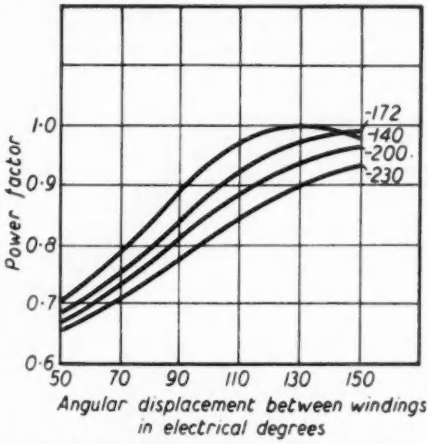


Fig. 8. Running performance : effect of different capacitance at 0·04 slip

with 90° displacement without appreciable effect on either the maximum starting torque or the other motor characteristics. In the calculations, the values of R_c have been related to X_c by the graph given by McFarland.[4]

Running Performance

The normal running capacity is given in this case by $R_c=9·0$ and $X_c=-172$. The friction and windage loss is 13 watts. Using the same machine constants as before, the running performance was calculated for various values of α and at slips ranging from 0·01 to 0·08; the results are shown in Figs. 5 to 7. Again the output is a maximum at about $\alpha=120°$ at all values of slip. There is an all round improvement of performance when the angle is increased from the usual 90° to about 120°, noticeably in power factor.

Effect of Varying Capacity

The effect of changing the capacity was calculated for a fixed slip of 4%. The results are shown in Figs. 8 and 9. Again the optimum value of α is not greatly affected by the capacitor value. Also, Fig. 9 shows that almost the

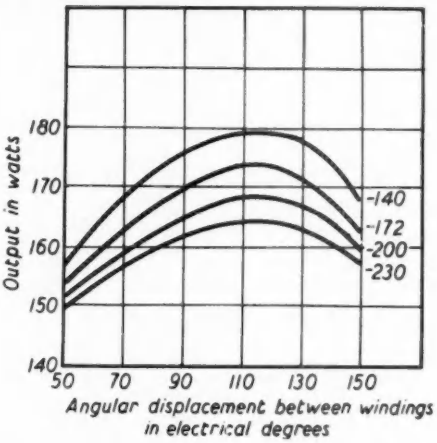


Fig. 9. Running performance : effect of different capacitance at 0·04 slip

same output can be obtained at 4% slip with $X_c=-200$ and $\alpha=110°$ as with $X_c=-172$ and $\alpha=90°$. In other words, if the motor is designed with $\alpha=110°$ or thereabouts, both starting and running capacitors can be reduced without appreciable detriment to the performance.

Conclusion

Although it carries the disadvantage that the motor must be designed for a given direction of rotation, a considerable advantage can be obtained if a capacitor is designed with 110° to 120° displacement between main and auxiliary windings, in that either (1) the capacitor size and cost can be reduced, or (2) the performance can be improved.

REFERENCES

1. Capacitor Motor with Windings not in Quadrature. PUCHESTEIN & LLOYD. Trans. A.I.E.E., Vol. 54 (1935).
2. Analysis of Unsymmetrical Machines. LYON AND KINGSLEY. Trans. A.I.E.E., Vol. 55 (1936).
3. Dyadic Circuit Analysis (Book, 1939). A. P. T. SAH. The International Text-Book Co.
4. Current Loci for the Capacitor Motor. MCFARLAND. Trans. A.I.E.E., Vol. 62 (1942).

Appendix—Maximum Torque

Equation (13) gives $T_0 = K_0 I_a I_b \sin\varphi \sin\alpha$ and the currents I_a and I_b are given by equations (9). At standstill, let

$$A = a_1' + ja_2'$$
$$B = C = (b_1' + jb_2')\cos\alpha$$
$$D = d_1' + jd_2'$$

For values of α given by $60° < \alpha < 120°$ terms in $\cos^2\alpha$ are negligible, and therefore from equations (9),

$$I_a = \frac{(d_1' + jd_2') - (b_1' + jb_2')\cos\alpha}{(a_1'd_1' - a_2'd_2') + j(a_2'd_1' + a_1'd_2')}$$
$$= (\text{say})\ (d_1'' + jd_2'') - (b_1'' + jb_2'')\cos\alpha \quad \ldots\ldots(14)$$
$$= (d_1'' - b^1\cos\alpha) + j(d_2'' - b_2''\cos\alpha) \quad \ldots\ldots(15)$$

Similarly,

$$I_b = (a_1'' - b_1''\cos\alpha) + j(a_2'' - b_2''\cos\alpha) \quad \ldots\ldots(16)$$

Substituting (15) and (16) into equation (13) gives—

$$T_0 = K0(a_2 - b_2\cos\alpha)\sin\alpha \ldots\ldots\ldots(17)$$

where a_2 and b_2 can be expressed in terms of a_1'', b_1'', etc.

Differentiation of (17) with respect to α gives the value of α for maximum T_0, that is,

$$\alpha = \cos^{-1}[c_2 \pm (c_2^2 + 0{\cdot}5)^{\frac{1}{2}}] \ldots\ldots(18)$$

where $c_2 = a_2/4b_2$.

In the example in the paper, $a_2 = 83{\cdot}05$, $b_2 = 57{\cdot}04$, and hence $\alpha = \cos^{-1} 0{\cdot}431 = 115{\cdot}5°$.

A similar procedure can be applied to finding α for the maximum value of torque/ampere, that is, T_0/I_L.

ACKNOWLEDGMENT

The author wishes to thank the Director, Indian Institute of Science, for his encouragement and permission to publish the article.

Our readers' views . . .

Water Heating Efficiency

I WOULD like to raise one or two points that appear to have escaped the attention of other correspondents.

In the first place (much as I dislike admitting this, being a staunch supporter of electric water-heaters), the electric storage water-heater is not such a valuable off-peak load as it would appear. Take the morning peak as an example. The heater has reached maximum temperature overnight and has cut out, but as soon as the household rises, at say 7 a.m., hot water is used for washing, shaving and preparing breakfast; so the thermostat cuts in again and stays in till the breakfast dishes are washed up, which in turns holds it in for a bit longer. Hence it would seem all heaters all over the country will be on load from about 7 a.m. to 9 a.m.—one of the severest peaks.

To confirm this theory, I connected a recording voltmeter across the heater element of my own 1½-gallon sink heater and the resulting record showed that the view expressed above is substantially correct.

However this does not rule out water heaters as *potential* off-peak loads but they will only be such if fitted with additional control as well as the thermostat.

The second point that I wish to raise is that although it can be shown that electric water heating is an inefficient form of fuel usage, these figures do not take into account the transmission losses in the case of solid fuel (i.e. manpower and fuel used for delivering the coal). Also no account is taken of the additional fuel—not to mention soap and labour—required with solid fuel water heating in keeping the house clean; this is substantially reduced in the case of the house using electric water heating.

J. K. Maynard
(A.M.I.E.E.)

BLACKHEATH, S.E.3

MR. VIGERS in his letter in your issue of November 15 states that electric water heating is a luxury that the country cannot afford at the present time and in doing so makes the very common mistake of confusing space heating with water heating.

The Building Research Station have spent a large sum of money on experiments in house heating in order to replace the suppositions of the Egerton Report with facts. Let these facts speak for themselves. The experiment showed, amongst other things, that solid fuel appliances could have an overall efficiency as high as 80% *when used for combined space and water heating*. They also showed, however, that when used for water heating alone the efficiency dropped to about 15%. It is quite clear, therefore, that whatever the merits of solid fuel appliances for combined space and water heating in winter are, they cannot be recommended for summer water heating.

So far as summer water heating is concerned the figures given by Dr. Weston of the Building Research Station in his paper "House Heating with Limited Coal Consumption" are interesting. These figures, when translated into

quantities of fuel, give consumptions of 98·5 lbs. of solid fuel, 2·76 therms of gas and 35·2 units of electricity per week. In order to convert these to a consumption of fuel basis let us take the production figures for gas and electricity quoted at the Combustion Engineering Association conference by Mr. Dyde of the Eastern Electricity Board, i.e. one ton of coal produces 150 therms of gas or 1,800 units of electricity and we get 98·5 lbs. of coal for solid fuel summer water heating, 41·3 lbs. of coal for gas and 43·7 lbs. of coal for electricity. Nothing here to suggest that gas or solid fuel is from two to four times as efficient on a coal economy basis as electricity, and everything to suggest that compared with solid fuel, electricity is far more desirable for summer water heating on a fuel economy basis and that taking into account the poor quality of coal used for generating electricity, there is nothing to choose between gas and electricity.

E. M. Ackery

B.E.D.A., LONDON, W.C.2

Demonstrators' Status

MANY of the older demonstrators will agree wholeheartedly with the paragraph in your editorial in the ELECTRICAL TIMES of November 22nd, and I would like to quote you my own experience.

I joined the industry in 1930 as a showroom attendant and later qualified as a demonstrator. During the war years and immediate post-war years, I undertook, in addition, the duties now carried out by a showroom supervisor. This included the training of new staff, a number of whom are now graded higher than myself.

In the past I have encouraged many girls into this branch of the industry, but now hesitate to do so knowing that higher grading is open to showroom attendants.

Marion Thody

ST. ALBANS

THANK you for bringing to public notice in your editorial of the November 22nd issue of the ELECTRICAL TIMES the dissatisfaction of demonstrators with their grading.

May I point out that this is by no means confined to those on the lower grade? Our status on Grade 2 is humiliating when positions held in the past are taken into consideration.

Previously—with preliminary qualifications—many of us graduated through the showroom, often undertaking the duties now carried out by the service centre supervisor and finally qualifying as housecraft advisers. We now find that service centre attendants—often without qualifications—can attain higher gradings than demonstrators and many unqualified "demonstrators" are entering the industry on the same grade as those with experience and qualifications.

The electrical housecraft adviser has been turned into a "dead-end" profession for which I would recommend no one to train.

Grade 2 Demonstrator

Gas Turbine Locos

THE report of the Hawksley Lecture delivered by Dr. H. Roxbee Cox and printed in your issue of November 29, raises a most important point with regard to the future of rail transport.

Several Committees have recommended main line electrification in this country and after the last report of the Cock Committee it looked as though, at long last, some action might be taken towards this end.

Now, according to Dr. Roxbee Cox, we have in active development a gas-turbine, geared, direct-drive locomotive with efficiencies of between 10% and 19% depending on the load. This at first sight, brings it close to the efficiency of the electric tractor. The result of this progress will now permit the protagonists of electrification and the gas-turbine to indulge in interminable discussion and arguments on the relative merits of the two forms of locomotion; and if the history of steam versus electricity is any guide, it may be years, even decades, before any positive action is taken.

The logical way to avoid this would be to proceed with the electrification of one part of the system only, preferably choosing a line including towns which have a heavy local rail-borne passenger traffic, and to experiment with, and possibly use, gas turbines, only for long hauls through predominantly rural areas. This has two merits. First the main line electrification would connect up districts where suburban electrification is either in being or contemplated (and it is doubtful if the gas-turbine is suitable for this work), and second, as power stations are located within the industrial areas transmission losses would be reduced. At all costs, for the well being of the country, progress must not be held up indefinitely while the pros and cons of these two traction types are debated.

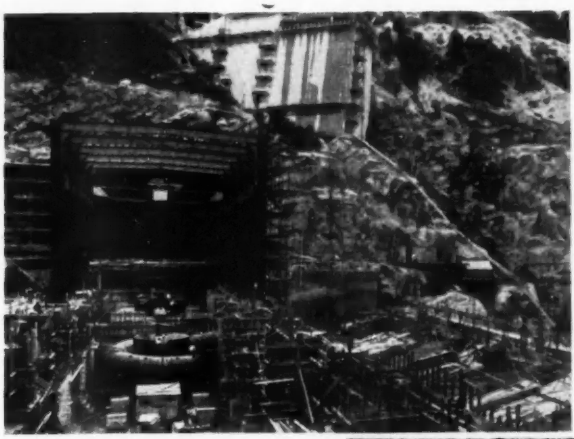
J. Jay

LONDON, W.C.1

Progress in New Zealand

Extensive Exploitation of National Hydro-Electric Power Resources

THE Annual Report of the State Hydro-Electric Department of New Zealand for the year 1950 emphasises the world-wide shortage of power, and also the widespread lack of labour, and raw materials required to improve the situation. As is well known, New Zealand is favourably placed as far as natural resources are concerned, and is at present engaged in exploiting water-power resources, geothermic heat, and the available coal. In addition to the power-station development, comprehensive power transmission and distribution schemes are being built. Progress, however, on all these schemes is erratic due to labour troubles and irregular or delayed delivery of raw materials.



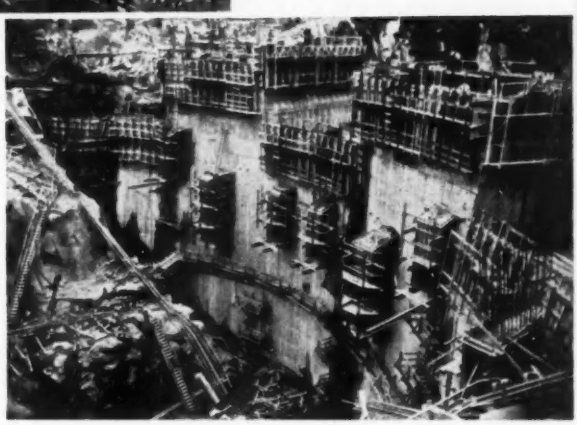
Above is a view of progress on the Maraetai power house. Below, right, is the arch dam, downstream face

North Island Generation

Progress at Maraetai has been resumed after a set-back of some months due to labour difficulties. The present programme is to fill the lake to give a head of about half the normal amount in October, 1952. At this stage the use of the diversion tunnel will cease, and the water will be passed either through the turbines, or through two penstocks left specially for the purpose. If possible three machines will be run to give a total output of 30,000 kW. By the end of 1952 it is hoped to get the machines on full load with an output of 108,000 kW. The fourth unit should be installed and operating in February, 1954, and the fifth and final machine in May, 1954.

Work is not so far advanced at Whakamaru—scheduled for first operation in 1955; at Waipapa, where the survey and design work is still in progress, and at Waikaremoana, where leak sealing in the lake is being carried out.

Important investigations on the source of geothermal steam are proceeding at Wairakei, and new drilling equipment has been procured to enable exploration to be carried out at depths of 2,000 feet. The quantity of heat being obtained from shallower bores is already considerable. Exploratory work is also being carried out to locate suitable coal-fields for supplying fuel to a coal-operated steam station.



The interior of a concrete block lined tunnel, part of the Lake Tekapo scheme

South Island

At Cobb, progress is not up to schedule mainly due to lack of manpower. It is, however, expected that the power-house and penstock will be ready for operation by the winter of 1953, although the construction of the main dam may not be finished for a year later. At times, when there is sufficient water available, it is hoped to run one of the two new machines during the 1953-54 period. General proposals have been formulated for the Lake Rotoroa area.

One scheme in operation is at Tekapo, where the generating unit went into operation after an initial setback due to a fault in the alternator. Work is now proceeding on the control dam which is scheduled for completion by August, 1953. In the meantime a temporary coffer-dam is being built, and it is expected that if the next two years are normal up to 90% of the designed output can be obtained under these conditions.

Work is nearing completion at Pukaki, and water storage being built up; at Waitaki, however, the work of installing the two units is behind schedule, but corrective measures have been taken and the work should be finished by 1954. At Roxburgh it is hoped to have the station in operation by 1956, and at Waipori, the Dunedin City Council's project, good progress has been made, and, all being well, No. 3 station should be in operation by mid 1953, and No. 4 station towards the end of 1953.

Transmission

Some details of the transmission scheme were given in the ELECTRICAL TIMES of August 23, and of the distribution system in our issue of September 20. Good progress has been made with the building of the 220 kV lines, the first line from Waikato to Auckland being completed, and the first circuit to Bunnythorpe will be finished by the time Maraetai is ready to run.

Materials for the South Island 220 kV line are on order, and the first section from Timaru to Christchurch is scheduled for completion in early 1954 to take power from the new Waitaki additions. The 66 kV line to Westport is not expected to be ready until the end of next year, while the tie line between Nelson and the main South Island system is expected to be finished by the end of 1953.

Altogether, work in hand or planned for the near future totals over 2,000 miles of line, of which nearly 1,300 miles is for the North and South Island 220 kV transmission systems.

The main 220 kV substations at Otahuhu, Bunnythorpe, Haywards and Islington are making good progress despite some irritating delays in the supply of equipment. For example, structural steel for the outdoor switchgear was ordered in 1947 but is not expected to arrive until early in 1952, and even then will not be complete.

Finance

The result of operation over the year ending March 1, 1951, showed that the net profit after taxation of £256,287 was £80,448 short of the amount required to pay the full statutory loans redemption charge of £336,735, and this deficiency has had to be met out of the General Reserve Account which was thereby reduced to £64,233. Although gross revenue at £4,216,436 was £264,878 greater than in the previous year this was more than offset by increased operating costs which at £2,367,591 were £541,914 higher than in 1949-50.

These increased costs are attributed more to greater thermal and auxiliary plant operation than to any other cause, and thus, financially as well as technically, the bringing into operation of the hydro-electric projects at an early date is of the utmost importance.

Capital expenditure during the year amounted to £8,266,378, and the asset value

of the Department's undertakings now stands at £61,777,291.

Generation

Apart from the general limitation on increase of load, no further restrictions were necessary in South Island. In North Island, however, special restrictions on consumption began on April 3, 1950, and continued throughout the year. The poor rainfall restricted the hydraulic power available generally, and required greater output from the thermal stations. Consumption for the year in North Island was 1,753 million units compared with 1,738 million the previous year, an increase of almost 1%, whilst consumption in South Island was 792 million units, or almost 1·75% in excess of the amount of power allocated.

Total units generated and purchased for the system in North Island were 1,999 million compared with 1,970 million in 1949-50. Comparable figures for South Island were 932 million as against 900 million.

The Report contains several appendices which analyse in detail the system operation and the working of the individual stations.

Rural Electrification

Subsidies amounting to £49,381 per year are being made to several Supply Authorities to enable them to proceed with rural electrification, and new applications are being received. It is, however, pointed out that there appeared to be no object in some authorities making fresh applications, when much approved work in their areas had not been completed. The Rural Electrification Reticulation Council had, therefore, decided to refer back new applications for subsidy from Supply Authorities who were not making substantial progress with work already approved.

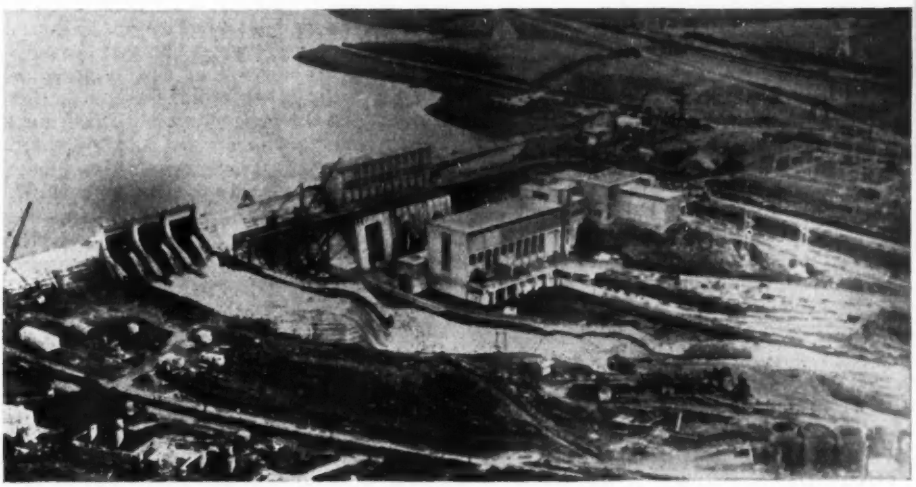
The subsidies already approved covered 1,806 route-miles of line which would supply some 3,200 consumers. To date (March, 1951) 731 miles had been completed, and 1,430 consumers connected, mostly in farming areas.

River Erne Exploitation

THE first of the two 22·5 MW generating sets at Cathaleen's Falls on the River Erne went into commercial operation last Tuesday (November 27) when Mr. J. B. S. Lawlor, station superintendent, connected the unit to the network of the Eire Electricity Supply Board.

This marks the half way mark in the exploitation of the hydro-electric power of the River Erne, as one of the two 10 MW units is already running at Cliff power station approximately four miles or so farther upstream.

At the moment the output of the stations is restricted as the water storage development work on Lough Erne, which is in Northern Ireland, is still in progress and will not be fully completed for some years. This work incidentally, which will cost about £750,000, is being carried out under an agreement between the Northern Ireland Ministry of Finance, and the E.S.B. In addition, a drainage scheme costing £340,000 is being carried out by the Northern Ireland Government.

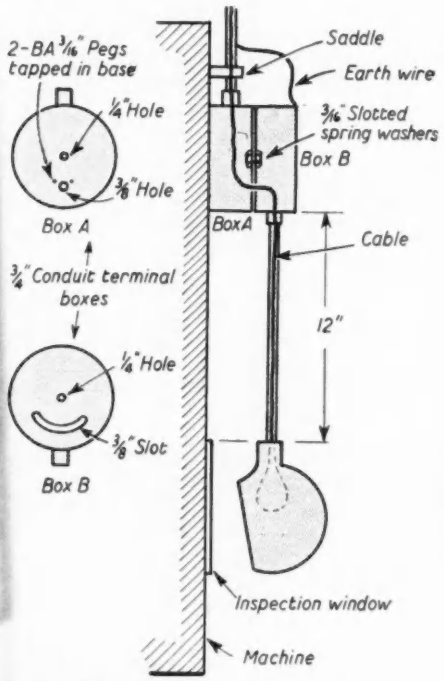


Problems and Practice IN ENGINEERING

Semi-Rotary Joint

A MACHINE of tank shape, with oppositely placed inspection windows required illumination at an inspection window from an external lamp. The lamp had to be made removable to allow access through the window to moving parts, water jets and other internal equipment and fittings.

A semi-rotary joint was constructed as follows: the ¾ in. service conduit was terminated



Constructional details of rotary joint suitable for use with inspection light

in a normal ¾ in. terminal box 12 in. above the inspection window. The box was drilled and tapped and fitted with pegs (box A) and fixed with its lid facing the machine. A 12 in. piece of conduit was fitted with a lampholder on one end and a ¾ in. terminal box was screwed on the other. This box was drilled and slotted as box B. Both boxes were then mounted back to back, after being lightly smeared with grease, and a ¼ in. bolt with spring washers is fitted through the central hole and used to bolt the boxes together, with the slot in B opposite the hole in A. The slot also had to fit over the two pegs tapped into the base of box A as mechanical stops.

The two conduits were bonded together with an earth wire to ensure good earth circuit continuity. Tight fitting of the ¼ in. bolt had to be checked to avoid play in the joint.–*F.F., Newark.*

An Unusual Motor Fault

THE writer had a rather interesting motor fault to investigate. A grinding machine was connected up temporarily and being on a wood floor was left unearthed. It was driven by a 3-phase 440-volt squirrel cage motor fitted inside the bed of the machine. It was found that intermittent shocks were being received on touching the machine. A Megger test on the motor gave infinity and a trial was made without the belt to rule out static charges; shocks were still received. The motor was dismantled and nothing could be found amiss, so the motor was re-assembled on the bench, but still the frame became intermittently alive when running.

It was then noticed that a small spark was given out on the fan side of the rotor, and on again dismantling it was found that one turn of the stator winding stood slightly proud of the others and the balancing bolt on the fan had scraped the enamel away. There must have been enough whip on the fan at full speed to touch the conductor, because the megger would not show a reading when the rotor was slowly turned by hand. The bearings were standard ball and roller races and the motor was mounted horizontally, so it is not probable that there would be any movement here. On lashing down the end turn more tightly, and re-insulating, the motor was quite O.K.—*H. W.*

Contributions to this page dealing with specific items of interest to electrical engineers and maintenance men are welcome, and, if accepted, will be paid for at our standard rates. Contributions should be written on one side of the paper only and may be accompanied by sketches, which will be re-drawn for publication.

H.V. System Regulation

Nomograms to simplify calculation of voltage regulation of transformers and cables

By J. BOGGIS, A.M.I.E.E., G.I.Mech.E.

AMONG the many factors which must be considered when designing power networks, voltage regulation is outstanding. Often a choice may be made between alternative proposals for supplying new loads by consideration of this factor alone. Where the voltage drop is mainly resistive, as in underground cable networks, there is a close connection between inherent regulation and copper losses. Usually, good regulation and low copper losses go together.

It is not necessary to know the regulation with great accuracy, and in any case future loads are uncertain. But precise formulae should be known as a check on the approximate methods which are used in practice. Graphical computation of regulation will appeal to the power engineer; many charts and nomograms for this purpose have been published. Two further charts are presented here; one for transformers regulation, and one for 11 kV cable data.

In a previous article[1] the regulation of l.v. networks was examined. Now the next two links in the chain from the consumer to the power station are the h.v./l.v. transformer, and the h.v. network. In the nomogram this network is assumed to be an 11kV cable system, though the other methods of calculating regulation which follow are generally applicable to systems in which charging currents can be neglected.

An important difference between the regulations of cables and that of power transformers is that for cables the voltage drop is not a sensitive function of the load power factor—but for transformers it is. This should be kept in mind when assessing the errors of transformer calculations because the power factor is frequently estimated from the general characteristics of the load.

Simple Representation

A cable or line can be represented by a single impedance, as in Fig. 1, if balanced loads are supplied by a symmetrical system. The case of unbalanced loads on h.v. systems is not so important as the unbalance of l.v. systems, because the diversity between the many l.v. loads results in h.v. loads which are approximately balanced. But where single-phase furnace or welding supplies are given direct from the h.v. system, and form an appreciable part of the load, the assumption of balance may not be justified.

Transformers, excluding all special types such as 3-winding, Scott, and so on, may be represented as a single impedance. This simple equivalent circuit, which neglects the magnetising current, is adequate for studies of regulation, load sharing, and short-circuit calculations. It follows that there is no essential difference between the formulae for cable regulation (charging current neglected), and those for transformers (magnetising current neglected). The formulae for cables and those for transformers do not, at first sight, appear to have a common origin: but they have.

Fundamentally, there are only two distinct expressions for regulation, either the regulation

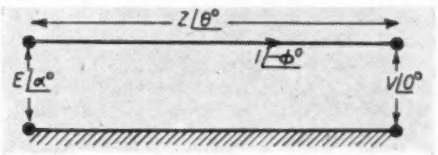


Fig. 1. Simplified diagram for cable, line or transformer (see text)

up: $R_{up}=(E-V)/V$; or the regulation down; $R_{dn}=(E-V)/E$. These expressions can be evaluated either as per-unit quantities or as per cent. quantities. It is more convenient in the theoretical treatment which follows to use p.u. values, but for practical computation per cent. values may be preferred. Voltage drop terms, such as I.R and I.X, can also be expressed as per unit values with the unit voltage take as E or V; these terms will be denoted thus: $I.X/E=X_{pu}$ $I.R/E=R_{pu}$ $I.Z/E=Z_{pu}$. It is easy to see that the regulation cannot exceed Z_{pu} to the appropriate base, i.e. $R_{up}\leq Z_{pu}$ $V=1$, and $R_{dn}\leq Z_{pu}$ $E=1$.

Regulation Down

The regulation down is defined as the difference between no-load voltage and on-load voltage expressed as a per unit value on a base of the no-load voltage. It is the fall in voltage as load is thrown on a system.

Taking V as the reference vector, see Fig. 1, the load current $\mathbf{I}=I/\underline{-\varphi}$ amps lagging. Let $\mathbf{Z}$=line or cable or transformer impedance in vector ohms $=Z/\underline{\theta}=R+jX$. Then: $\mathbf{E}=\mathbf{V}+\mathbf{I.Z}$, where $\mathbf{I.Z}=I/\underline{-\varphi}.Z/\underline{\theta}=P+jQ$.

Therefore $P=IR.\cos\varphi+IX.\sin\varphi=IZ.\cos(\theta-\varphi)$

and $Q=IX.\cos\varphi-IR.\sin\varphi=IZ.\sin(\theta-\varphi)$

Also: $\sqrt{(P^2+Q^2)}=IZ$. By using these additional symbols, P and Q, the in-phase and quadrature components of the impedance voltage, the various formulae are abbreviated.

The relationship between V and E is given by: $\mathbf{E}=E/\alpha=(V+P)+jQ$. Squaring: $E^2=(V+P)^2+Q^2=V^2+2PV+P^2+Q^2$. Solving this quadratic for V, and taking the positive root, the result is: $V=-P+\sqrt{(E^2-Q^2)}$.

Now let E be a vector of unit length and reduce P and Q to per-unit values which we shall indicate by lower case letters.

$V/E=V_{pu}=-p+\sqrt{(1-q^2)}$ .....(1)

$R_{dn}=1-V_{pu}=1+p-\sqrt{(1-q^2)}$....(2) exactly

$R_{dn}=1+p-(1-q^2/2)=p+q^2/2$....(3) approximately

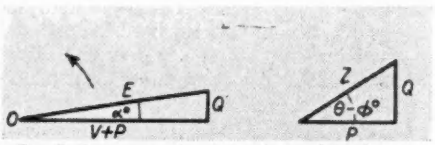


Fig. 2. Diagrams showing relationship of q to α

When expanded (3) assumes the familiar form of the standard expression for transformer regulation given in BS 171: 1936, namely:

$$\%\text{Regn.}=R.\cos\varphi+X.\sin\varphi+\frac{(X.\cos\varphi-R.\sin\varphi)^2}{200}$$

where R and X are the percentage voltage drops. The exact expression (2) has been derived in a previous article[2] from the geometry of the vector diagram.

For low reactance transformers, say less than 5%, the term $q^2/2$ can be neglected when the load power factor is lagging. This second-order term is insignificant for lines and cables giving: $R_{dn}=p=R_{pu}.\cos\varphi+X_{pu}.\sin\varphi$.....(4) The regulation is, therefore, roughly proportional to the load. The more accurate formula (3) can be written in a form which is more convenient than the standard form for computation: $\%\text{Regn.}=P+\frac{(Z-P)\ (Z+P)}{200}$ where $P=R.\cos\varphi+X.\sin\varphi$ percentage voltage drop.

Regulation Chart

The exact expression (2) can be written in trigonometrical terms as:

$$R_{dn}=1+Z_{pu}.\cos(\theta-\varphi)-\sqrt{[1-Z^2_{pu}.\sin^2(\theta-\varphi)]}$$

where $\theta=\tan^{-1}X/R$.

From this a family of curves may be drawn as in the chart. To use this chart draw a line from the load power factor to the transformer R/X or R/Z ratio and note its inter-section with the line A —A. From this point a perpendicular to A —A is drawn to cut the appropriate Z curve; opposite the regulation down is given. On the same perpendicular the inter-section with the dotted Z curve gives the angular displacement caused by the regulation.

This angular displacement between the no-load position of the secondary voltage and the on-load position is given by: $\sin\alpha=q=Z_{pu}.\sin(\theta-\varphi)$, so that it is a function of Z, θ, and φ and can be shown on the same chart as the regulation. Fig. 2 shows the relationship of q to α.

Regulation Up

The regulation up is defined as the difference between the no-load voltage and the on-load voltage expressed as a per-unit value on a base of the on-load voltage. It is the voltage rise as load is thrown off a system. Taking V as the reference vector, and letting all the symbols have the same significance as before, excepting that now V is the per-unit base, then: $E^2=V^2+2PV+Z^2$. Therefore, $E^2_{pu}=1+2p+Z^2_{pu}$. From this the exact expression for the regulation up is:

$R_{up}=E_{pu}-1=\sqrt{(1+2p+Z^2_{pu})}-1$ .....(5)

A similar proof is given by A. Pen-Tung Sah[3] who in accordance with American practice, defines transformer regulation as the regulation up.

An approximation by the binomial theorem to the exact rule (5) leads to a remarkable result; i.e.:—

$R_{up}=p+q^2/2$ .....(6)

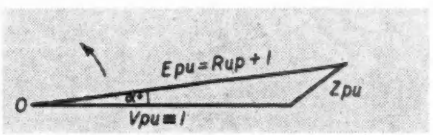
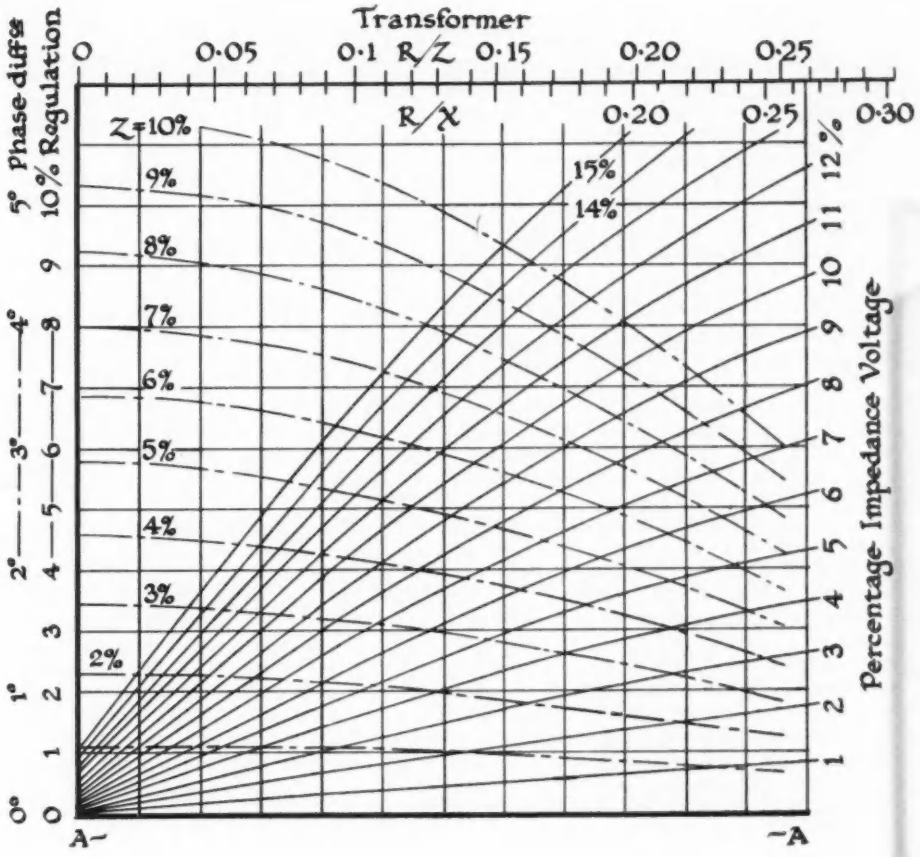


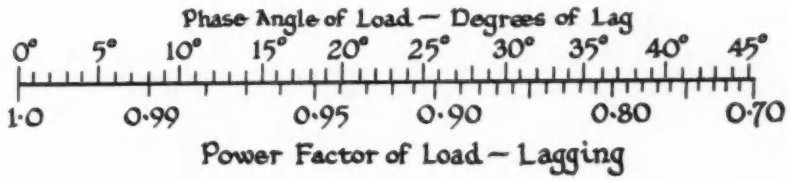
Fig. 3. Vector diagram to show regulation "UP"

This is apparently, without careful consideration of the meaning of the symbols, the same as the approximation for R_{dn} in (3). But p and q in these formulae have different bases. Neglect of the second term again gives the simple $R.\cos\varphi+X.\sin\varphi$ rule which is often used in transmission calculations.

Taking I, the load current, as the reference vector instead of V, a symmetrical exact formula for regulation can be obtained, but



Transformer Regulation. J.B.



this is usually left as an expression for E. Since I is the datum:—

$$E = I(R + jX) + V(\cos\varphi + j.\sin\varphi)$$
$$= (IR + V.\cos\varphi) + j\,(IX + V.\sin\varphi).$$

Therefore:—

$$E = \sqrt{[(IR + V.\cos\varphi)^2 + (IX + V.\sin\varphi)^2]};$$

from which this follows:—

$$E_{pu} = R_{up} + 1 = \sqrt{[(R_{pu} + \cos\varphi)^2 + (X_{pu} + \sin\varphi)^2]} \quad (7)$$

Angular displacement is now, with V as the per unit base, $\sin\alpha = q/E_{pu} = q/(1 + R_{up})$. In Fig. 3 the vector diagram shows that Z_{pu} is added to the unit vector V to give E_{pu}; this addition of a vector to unity has been tabulated[4] making it possible to determine the regulation up and the displacement without calculation.

11kV Cables

For cable systems it is convenient to calculate voltage drops using the simple formula (4), and to work directly in terms of phase to neutral volts on a single-phase basis. In the nomogram the voltage drops for power factors of unity and 0·9 lagging are given for 11 kV belted cables to BS 480: 1942. In addition the copper losses and basic E.R.A. current ratings are given. Since the current ratings can be fairly accurately fitted by an empirical power law ($I = C.A^n$ where n is about 0·55) the nomogram has sufficient accuracy on these scales.

But for the scale which gives the voltage drop at 0·9 p.f., a *spurious* nomogram has been constructed which has limited accuracy. It is quite an easy matter to construct an accurate nomogram for voltage regulation alone: it is not so easy to incorporate the losses and current ratings on the same nomogram. However, the resulting loss in precision is matched by the uncertainty of the given data in any practical problem. For an account of spurious nomograms, which are constructed by minimising the errors at faulty intersections of construction lines, the reader is referred to Reference 5 below.

Power factors, other than 1·0 and 0·9, may be substituted in this approximate formula:—

Voltage drop, phase to neutral

$$= \frac{2{\cdot}5}{A}\,(\cos\varphi + 3A.\sin\varphi) \text{ volts/100 amps/1,000 yd.}$$

Taking as an example 200 amps supplied via 5,000 yd. of 0·25 sq. in. 3-core, the formula gives for 0·9 p.f. lagging:—

$$V.D. = 2{\cdot}5/0{\cdot}25\,(0{\cdot}9 + 0{\cdot}75 \times 0{\cdot}436) \times 10 =$$

123 volts

In comparison, the nomogram's result is 25 volts for 1,000 yd. On the same alignment, the drop at unity p.f. is 20 volts, and the copper losses are 12 kW.

Worked-out Example

It may assist the reader if an example on transformer regulation is also worked out and compared with the chart. If R=1% and X=5%, the regulation at 0·8 p.f. lagging is found as follows:—

$p = 0{\cdot}01 \times 0{\cdot}8 + 0{\cdot}05 \times 0{\cdot}6 = 0{\cdot}038$ p.u.

$q = 0{\cdot}05 \times 0{\cdot}8 - 0{\cdot}01 \times 0{\cdot}6 = 0{\cdot}034$ p.u.

From the exact expression (2) we have $R_{dn} = 1 + p - \sqrt{(1 - q^2)} = 1{\cdot}038 - \sqrt{(0{\cdot}998844)}$. There is great difficulty in evaluating this accurately without recourse to the binomial expansion; but using 6-figure logarithms the result is 0·038+0·00576. Now the approximation (3) by 10-in. slide rule is 0·038+0·00577, which becomes by rounding off to 3-figures, R_{dn} = 3·86%. It is obvious that the approximation is so close that the exact formula is of no practical interest—at least at reasonable regulations.

For the graphical method, a line is drawn from R/X=0·2 to p.f.=0·8 to intersect the base line A —A. At the point of intersection a perpendicular is drawn to Z=5·1 by interpolating between the curves. Opposite the result is 3·9% and the angular displacement is 1·95°, c.f. $\sin^{-1} 0{\cdot}034$.

REFERENCES

1. J. G. Boggis: "Voltage Regulations of L.V. Underground Cable Systems". The Electrical Times, May 10, 1951.
2. H. E. Green: "Transformer Regulation". The Electrical Times, October 5, 1950.
3. A. Pen-Tung Sah: "Alternating Current Machines". McGraw-Hill. First edition 1946.
4. J. Rybner and K. Steenberg Sorensen: "Table for Use in the Addition of Complex Numbers". Jul. Gjellerups Forlag 1948.
5. P. Lyle: "Regression Analysis of Production Costs". Oliver and Boyd 1944.

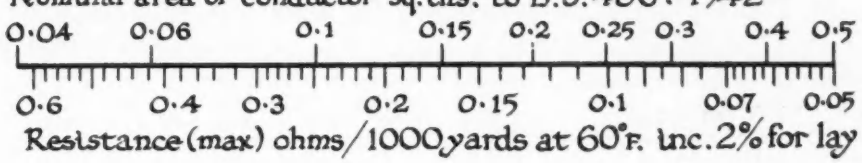
WIRED BROADCASTING

THE radio section of the I.E.E. discussed recently the relative merits of wired and normal broadcasting. Three aspects were covered: whether three programmes provided by a monopoly were sufficient; the economic advantages of one system over the other; and the technical difficulties involved.

Several speakers regarded a large number of programmes as essential in a democracy, while others considered that a certain amount of regulation of public taste and opinion was necessary. Captain Eckersley, the first speaker, was of the opinion that local news was important and this could be provided through wired broadcasting.

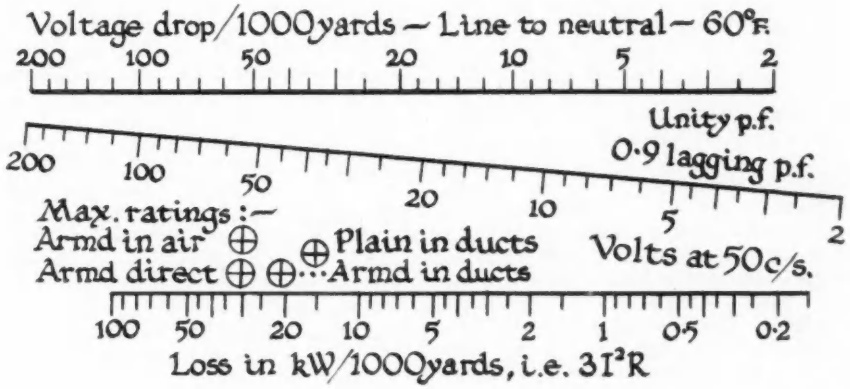
The suggestion that overseas listening was debarred by wired broadcasting was countered by the fact that overseas stations were usually received poorly.

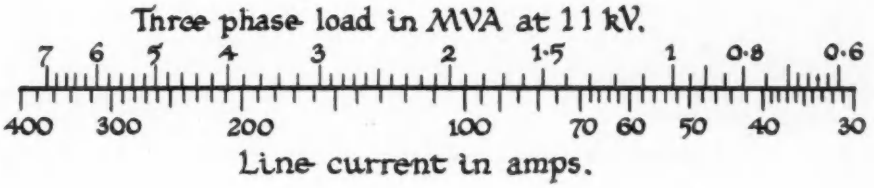
Economically and technically it was held that the two methods were comparable, and it was pointed out that there were already over a million subscribers in the country connected to wire-distribution relay systems.


Nominal area of conductor sq.ins. to B.S.480: 1942
0·04 0·06 0·1 0·15 0·2 0·25 0·3 0·4 0·5
0·6 0·4 0·3 0·2 0·15 0·1 0·07 0·05
Resistance (max) ohms/1000 yards at 60°F. inc. 2% for lay

NOMOGRAM: data for 11 kV paper insulated cables J.B.

3-core belted : earthed systems


Voltage drop/1000 yards — Line to neutral — 60°F.
200 100 50 20 10 5 2
Unity p.f.
0·9 lagging p.f.
200 100 50 20 10 5 2
Max. ratings :—
Armd in air ⊕
Armd direct ⊕ ⊕
⊕ Plain in ducts
⊕ Armd in ducts
Volts at 50 c/s.
100 50 20 10 5 2 1 0·5 0·2
Loss in kW/1000 yards, i.e. 3I²R



SUBURBAN TRANSPORT IN CANADA

British Firms Secure Large Toronto Order

FOLLOWING on the extensive purchases by Canada of steam generating plant, as reported in the ELECTRICAL TIMES articles on the Richard L. Hearn (Toronto) and J. Keith Clarke (Windsor) power stations, a further significant order has now been placed in this country for equipment for the Toronto Transportation Commission. This order was obtained by the Gloucester Railway Carriage and Wagon Co. in the face of other British, Canadian, American and Continental competition. The size of the order is such that it represents about 7,800,000 dollars.

Originally it was the intention of the Toronto Transportation Commission to purchase somewhat shorter cars of North American design, similar to the street cars now operating in Toronto. It was, however, found that the conversion of this type of vehicle to rapid transit work was too expensive. The heavy rolling stock as used on the New York system was also found to be dearer than the English designed type of equipment.

Car Design

After due consideration the car finally chosen will be approximately 57 ft long and 10 ft wide, seating 62 passengers and with three sliding doors on each side of the car. An unusual feature is that the track gauge of the Yonge Street subway is 4 ft 10⅞ in.

Motor equipment will be provided by Crompton Parkinson and Co., and the control gear will be produced by the British Thomson-Houston Co. Underframe and body of the cars will be of the all-steel integral design in accordance with modern conceptions. Sound deadening is provided by making the flooring of rubber, laid on a cork foundation attached to a dovetailed steel sub-floor. In addition, special sound deadening material will be applied to the inner side of the exterior body panels.

The bogies, designed and manufactured by the Gloucester Co., are arranged to mount two propeller shaft driving motors per bogie, with hypoid gear axle units, manufactured by David Brown and Sons. The motors will be frame mounted, and are, therefore, spring borne and not axle hung as has hitherto been conventional practice on railways.

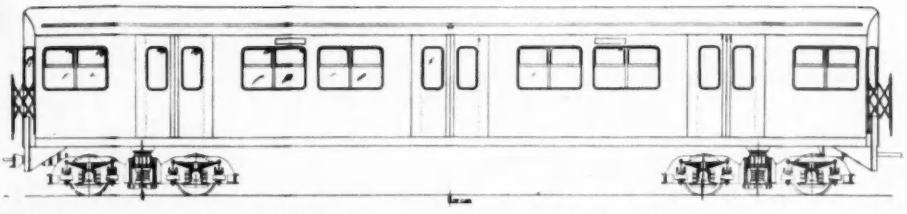
Suspension is by laminated springs in conjunction with triple-coil helical springs, and spring-loaded friction pads have been included to provide suitable damping.

Main Electrical Equipment

Each car will have a third rail shoe on each side for current collection. Control is of the B.T.H. P.C.M. electro-magnetic type, similar in many respects to the large number of equipments already in use on the London Transport system. All traction control equipment will be assembled in a single unit arranged for mounting under the coach. Lightweight resistors of the R.P. type, utilising edgewise wound aluminium chromium steel alloy strips, will be mounted in a separate frame again arranged for under car mounting.

As mentioned before, the traction motors are made by Crompton Parkinson and are of the usual series wound type operating with pairs permanently connected in series across the 600 V supply. Each of the 104 cars on order will have four 68 h.p. motors, which are designed for field diversion for fast running. They will be able to accelerate a fully loaded car at the high rate of 2·3 m.p.h./sec and are capable of giving a top speed in the region of 55 m.p.h.

Skewed slots have been used in order to minimise noise, and ventilation is provided by individual fans which draw clean air through ducts from inside the body of the coach. External tapered connections are being fitted



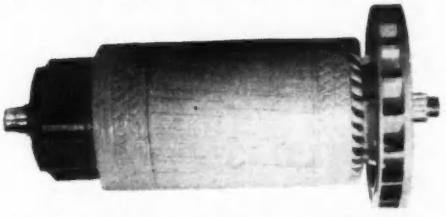
This line view shows the general body appearance. The electrical and braking equipment are not shown

in order to maintain an existing feature which is favoured in Toronto.

Auxiliary Supplies

Auxiliary supplies will be provided by a battery and m-g. set operating at a normal voltage of 50 V. The generator will be capable of a continuous output of 4 kW, its associated motor being supplied at the track voltage. This low voltage system is provided in order to operate various components, such as the control gear, doors, brakes, heating, ventilation and other features.

The m-g. set itself will consist of two similar armatures on a common shaft, surrounded by a common frame containing two independent field systems. Space and weight are thus reduced to a minimum. An interesting feature is that full output is obtained from the generator



View of traction motor rotor showing skewed slots

over a track voltage variation from 450 to 600 V. The output is controlled by a carbon pile regulator, normally giving a constant voltage characteristic, but including a current limiting device which becomes operative, for example, when a full auxiliary load coincides with a discharged state of battery. The battery itself has an ample capacity to carry all the control loads, as well as the emergency lighting, for a time sufficient either to complete a round trip on the railroad or to take the car out of service and evacuate the passengers.

To reduce unnecessary capital expenditure the batteries and the m.g. sets have been made of such a size that one set can supply the needs of two cars.

Operational Details

In operation, two cars will be semi-permanently attached to form a two-car unit which will be operated in off-peak hours. As traffic increases the units will be made longer by the addition of more two-car sets up to a maximum of eight cars. This gives the greatest length which can be accommodated by the 500 ft long platforms. At maximum capacity the system will be able to carry 40,000 passengers per hour in each direction.

The two cars of any one unit will be held together by a bar coupling mounting suitable draught gear, with electrical connections made by multi-conductor cables. The halves of a two-car unit will not be uncoupled except in the case of emergency and shop repairs.

When multiple-unit working is required, coupling of the two-car units together will be by means of automatic electro-pneumatic coupling made by G. D. Peters of England, and fitted at the leading end of each car. Switch control from within the cab gives coupler lock and changeover of electrical and air controls for through working.

Electro-pneumatic braking by Westinghouse Brake and Signal Co. of England will be incorporated, which will operate in conjunction with a retardation controller. This consists of a mercury filled U tube, having a series of contacts which are made or broken by the surge of the mercury as the train decelerates. This device ensures a smooth but rapid braking operation. The braking mechanism will consist of independent brake cylinders, each with automatic slack adjusters operating on eight shoes per bogie. This arrangement, similar to that used on London Underground cars, reduces noise and leads to uniformity of braking.

Lighting and heating equipment is being provided by J. Stone and Co. The heating and ventilation will be by means of 30 kW underfloor resistors, through which air will be circulated through seat pedestal louvres. Thermostatic control ensures a temperature of 62-65° F.

The lighting fixtures are of the incandescent type, one fixture over every seat, giving an illumination of 25 ft candles on the reading plane. In the case of a current failure, battery operated emergency lights will come into operation automatically.

While this is the largest order placed in U.K. by the Commission, other railway equipment for the scheme amounting in value to about two million dollars has also been ordered from this country.

This view of a motor illustrates the tapered connectors

THE SMITHFIELD SHOW—

EVEN as a layman, the visitor to the Smithfield Show, which opened at Earls Court Exhibition on Monday last, cannot but be impressed by the fine looking livestock to be seen. Naturally the Show lays particular emphasis on the rearing of stock for meat-production; in consequence, beef cattle of 14 different breeds, sheep of some 23 different breeds, and ten breeds of pigs are represented in the 1,300 animals entered for the prize competitions.

These beasts are representative of the British stock rearing industry and are good examples of the stock which has earned for Britain the cherished title of Pedigree stock nation of the world. It is indeed a sad reflection on the times that this country which can produce such fine creatures should have a meat ration so meagre.

There is of course a reason for our title: it is the care in breeding and rearing which our stockbreeders and herdsmen have for centuries lavished upon their charges. This care, however, is assisted by the abundant provision of mechanical equipment and machinery and this is exemplified by the trades sections displays which share the show with the livestock.

Provision of Power

Electricity was exclusively used for the "Farm of the Future" Festival Display in Belfast and despite national and international economic conditions it is available for adoption by the wise farmer today whether or not he is fortunate to have been included in the area schemes for farm electrification. There are many varieties of inexpensive generating plant available today which in a range of sizes supply power for all needs on large or small farms. Renowned names at the show include An-Doc Ltd., Blackstone, R. A. Lister, Petters and Arthur Lyons. The Blackstone / R. A. Lister displays include amongst diesel and petrol engines as prime movers, pumps and dairy equipment, a 2½ kW a.c. "Start-o-Matic" start on demand diesel engine generating set and a petrol engined 1 kW d.c. automatic generating set. Their horse and cattle clippers and sheep shearing machines operated by electricity are featured.

Arthur Lyons and Co. are also specialists and have featured a larger 5 kW diesel Alcomatic generating set, whilst An-Doc Ltd. have an all purpose unit which, costing less than a small motor cycle, has a 3 h.p. petrol engine, an air compressor and a water pump with delivery of 2,500 gallons, the fundamental principle also including a 12 V generating set for lighting: it is mounted in a portable "pram".

Lighting is an important factor in a stock farm and it is rather surprising to find only one well known lighting firm amongst the exhibitors, viz. British Thomson-Houston, with "Mazda" fluorescent and tungsten fittings for lighting farm buildings and floodlighting outdoor working areas such as the stockyard and sheds. However the Electrical Development Association have featured some of the many methods of lighting particularly for pig farrowing and fattening pens, and the proper adequate lighting of a hygienic calf house. Also shown is a selection of equipment used in ventilation, food preparation, the provision of ample hot water and steam for sterilizing, with grooming machines, infra red radiant heating and floor heating, and grain drying gear.

Fodder Preparation

The provision of winter food stuffs is an important factor in the farmers planning and it is in this field that many new and important introductions are to be noted. Outstanding is the fibre extracting equipment featuring control by an electronic "brain" which has been developed by Fyna Industries Ltd., in conjunction with the firm of Allied Electronics Ltd. Basically this comprises a Fyna grinding mill driven by an electric motor. The material such as dried grass, grain, hay, etc., is fed into the machine from an overhead hopper. The rate of feed is accurately controlled by a switch mounted on the control board. On the outlet side of the mill above the suction impellor are two solenoid operated valves. These are so arranged that in the first position the material is ground, drawn through a screen and blown into the left hand cyclone. Changing the position of the valves by solenoid operation, the fibrous and less easily ground material is drawn from the top of the screen and blown into the other cyclone. The whole operation is divided into three sequences all controlled electronically—(*a*) feeding sequence, material is fed, ground, sieved and deposited in first cyclone for bagging; (*b*) feed ceases, material still in mill is ground so that highest proportion of high protein material is passed into cyclone; and (*c*) valves change over automatically, unusable material is then drawn off into second cyclone.

Another new grain mill equipment is a new development of the Essex Major 3 h.p. automatic hammer mill by Christy and Norris Ltd.

TRADE SECTION SHOWS REASONS FOR QUALITY OF LIVESTOCK COMPETING

It is fitted with an inverted suction feed mounted on a new low level grain hopper. Also for the first time of showing is Mitchell and Colman's new "Strobust" straw chopper unit.

Templewood Engineering Co. show for the first time at the "Smithfield" the Mk. 1 Grass Dryer, which will provide 150 tons of good quality dried grass in a season when worked by one man on a 10 hour day. It is an oil fired unit with all movements operated by 3 phase motors with an average rating of 8.5 kW. It gives an output of 2.4 cwt/hr from 80% wet grass or 4.1 cwt/hr from 70% wet grass. A vegetable washer suitable for the larger stock keeper or market gardener is shown by Roadless Traction Ltd. for the first time. This "Esher" unit has a mobile belt conveyor passing over 1,500 water jets. Sprays are fed by a 2 in. delivery centrifugal pump driven by a 15 h.p. motor.

For vegetable cooking J. W. Wooley of Tamworth have provided this year an exhibit which won the Silver Medal at the recent Dairy Show. It is the Electrolid potato steamer which will cook 2 cwt of potatoes in 3½ hours at an economical current consumption. Unlike other steamers the 3 kW elements are fitted in the lid

Above is Wooleys' Electrolid potato steamer, right is the NCB mobile butchers' shop, and below, Fyna Industries' electronically controlled mill.

of the steamer, the pan is loaded, and, when lid is attached, it is turned upside down during steaming. After three hours steaming the lid can be removed, a normal lid substituted and the potatoes left to cook in their own residual heat. An added advantage is that the element lid can be removed, hung on a shelf or rack, and the steaming pans thoroughly cleansed without damage to the elements.

Although the Smithfield Show is concerned principally with beef cattle two firms have taken the opportunity of introducing to farmers new dairy equipment. Alfa Laval Ltd. have a new electric cream separator which dispenses with gearing, and a new electric pail heater with automatic cut out, whilst Simplex Dairy Equipment have produced a new "Impulsator" milking equipment which is not worked by vacuum but by 12 V current working solenoid operated pumps. Main advantages are simplicity and a 2: 1 ratio of pulsation with simultaneous suction of all four teats.

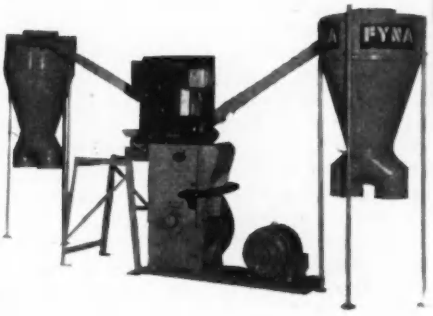
Grooming of livestock is catered for. Flextol Engineering feature new flexible shaft brushing gear, whilst clippers are displayed by many firms, Wolseley Sheep Shearing Co.'s electric units being worthy examples of the range. This firm, incidentally, has developed new electric fencing equipment designed for quick erection and easy removal for rotational or strip grazing and kale folding. By coincidence the Harvest Saver and Implement Co. are featuring a new "Warden" electric fence unit.

Despite the care lavished on prize stock and their progeny their fate is sealed when they arrive in this world, eventually their carcases we hope will supplement our rations. Perhaps they may be seen in one of the new Prestcold Service cabinet models SC154/254 or in the new open Frozen Food Cabinet model OFC 351, which the Pressed Steel Company Ltd. are exhibiting at the Show.

Or it may even be sold from the new "NCB" mobile butchers' shop which is the *pièce de résistance* of Smiths' Electric Vehicles.

This is based on the 1-ton "NCB" electric chassis, designed for inside service.

The roomy body is for use by fresh meat or pork butchers, and of solid coachbuilt construction. Hygienic plastic and stainless steel finishes are freely used, and the unit is complete with all essential shop fittings including washbasin, chopping block, stainless steel meat rails, counters and detachable shelves. All goods are readily visible to the customer and quickly accessible for the driver-operator.



Automatic Boiler Control

Systems for P.F. and Stoker Installations Analysed

CLOSE supervision of fuel and air supply is a necessity with all methods of steam raising using solid fuel fired in suspension, for with little fuel reserve any difficulties soon become apparent in steam conditions. The subject is considered at some length by Mr. LLEWELLYN YOUNG (Chief Engineer, Bailey Meters and Controls, Ltd.) in a paper recently presented to the Institution of Mechanical Engineers. His main concern in this paper is these characteristics of boiler design and performance which have favoured the parallel development of automatic control of boiler auxiliaries.

New and expensive materials now necessary in many boiler designs have added considerably to their cost, and to keep down expense attempts have been made to determine the limits of variation of temperature which can be expected during the life of the plant, so that the design figure may be used as a reliable basis for normal operation. One difficulty is that the increased proportion of heat absorbed by radiation, together with superheaters in zones of higher gas temperatures, has made boilers much more sensitive to firing rate than were units of earlier design. The benefits to be gained from the installation of automatic control are probably increased also by the shortage of installed generating plant, which has necessitated many boilers, originally designed for base load, being used for load regulating duties.

Control Principles

The author states simply the physical conditions applying in a boiler during load changes, and goes on to examine briefly the principles of automatic control. Turning to the apparatus employed (he considers compressed air systems), he described first of all the automatic controller, which is invariably a measuring instrument. A "ratio controller" may be necessary in cases where a pre-set ratio has to be maintained between two variables. So-called "regulating units" duly receive and translate the signal into terms of displacement, while in between come the operation of relays to modify and transmit the signal.

Electrical instruments are used for some controllers, examples being the temperature controller and the oxygen analyser, both of which use a bridge comparison method. Air pilot valves are linked with the indicating pointers of such instruments.

In the build-up of an automatic control system, the economic aspect inevitably assumes great importance, especially where efficiency, as distinct from safety, is the only factor involved. Careful calculation as to saving is hardly possible here, but experience has indicated that an improvement in thermal efficiency of the order $\frac{1}{2}$ to 1% can be obtained depending mainly on the quality of the boiler house staff. Capital cost is not dependent on boiler size, but varies rather with type and number of auxiliaries, and on such factors as steam pressure and temperature. For boilers of 250 klb/hr evaporative capacity and upwards it is unlikely to exceed $\frac{1}{2}$% of capital cost of boiler.

Practical Requirements

Basic requirements are control of fuel and air supply by boiler pressure; proportioning of fuel and air to give best combustion conditions, the ratio of steam flow to air flow providing the necessary control; maintaining of furnace pressure, which involves mainly the i.d. fan.

The remainder of the paper describes various control systems, beginning with a spreader stoker-fired boiler. Here two or three boilers are usually necessary to supply one turbine, and a steam receiver is the site for the master pressure controller. Panels at individual boilers accommodate other parts of the system, including the steam flow/air flow ratio controller and the furnace draught control. A steam temperature controller notes steam temperature changes at the secondary superheater outlet, and adjust a desuperheater valve.

For p.f. boilers with pressure mills, the control of proportions of primary, secondary and tertiary air is usually left to the operator, as flame appearance is an important criterion. In a typical system the main load control point for the plant is selected as the superheater outlet: steam temperature controls may take an initiating signal from the load controller, to avoid excessive time lag. Where several mills are available, as for boilers operating under wide load variations, an additional control is necessary to take account of the number in operation at any given time.

The Statistics of Supply

Mathematical methods can economically solve many distribution and transmission problems

SOMETHING of a missionary nature attaches to the paper which MR. R. B. ROWSON, B.SC., A.M.I.E.E. (South Wales E. B.) read before the I.E.E. Supply Section last week. Its title was "Electricity Supply—A Statistical Approach to Some Particular Problems," and the author's aim is well expressed by the opening sentence of his introduction: "The purpose of the paper is to illustrate the aid that the statistical approach can give to the commercial and engineering sides of electricity supply, and to encourage, by means of discussion, the publication of other applications of these methods."

In the early part of the paper, Mr. Rowson briefly sketched the mathematical techniques available for application to statistical work. He emphasised that the statistical approach often gave a standard against which results could be judged. A model was set up, from which calculations showed what should happen if the variables behaved at random. Actual results were then compared, and the chances of their occurrence calculated. Alternatively, the model might incorporate recorded experience, and the probability of a particular occurrence be calculated: for instance, the increased reliability of a substation due to the installation of an additional feeder.

For the remainder of the paper, the author picked out problems amenable to statistical treatment and outlined the methods that might be adopted for their solution. A full summary of this closely argued section of the paper would serve little purpose, but some of the more interesting points, rather arbitrarily selected, may be of value.

Examples

By examples as remote as generator outage, insulator failure, lightning arrestor operation and water heater demand, he demonstrated the value of the Poisson distribution as test, when the probability of the happenings investigated were very small. In the last case, comparison is made with measured after-diversity maximum demand curves. Another illustration concerned with diversity discussed the design of low-voltage lines, single or 3-phase, taking into account the effects of polarising in the neutral in the latter case.

One particularly interesting example, which may be discussed at some length, dealt with voltage variation at the consumers' terminals. It was pointed out that, if the legal $\pm 6\%$ requirement were strictly complied with, and the frequency distribution of voltages within this range were assumed "normal," then 68% of consumers would have a voltage variation within $\pm 2\%$ of the mean, and 95% voltages within $\pm 4\%$ of the mean. It had been suggested that a better way to fix a limit would be to require a coefficient of variation of voltage of 2%, for this would recognise that a very high or low voltage would occur at some time.

Checks on Tariffs

Standardisation of tariffs is a matter now interesting most area boards, and the author discussed methods of checking the effect on consumers of actual changes. In particular, the charge in the average and the spread of consumers' bills might yield useful information.

Another case where a test was required on a financial basis was that of street lighting lamp replacement, where the question to be decided was casual replacement as against planned renewal after a given lamp life. The two described in the paper showed that in a small scheme, with low-wattage lamps and probably high random-replacement costs, bulk replacement at, say, 800 hours lamp life was probably economic. With a large scheme, however, where night staff would be on duty in any case random replacement appeared to be financially advantageous.

DISCUSSION

Mr. D. P. SAYERS (Dep. Chief Eng., Transmission, B.E.A.) suggested that the statistician was usually concerned with the constancy of randomness of his data. The electrical engineer is mainly concerned with the unusual happening, for on this he must base his factor of safety. Nowadays, however, he cannot simply take old margins on trust, especially when working on a national scale. An example of the B.E.A.'s use of statistical techniques was the application of multiple regression analysis to records of temperature to check its effect on load. The importance of knowing this accurately is emphasised by one degree change in the most sensitive portion of the temperature scale, producing a load change of 80 MW. For load forecasting purposes, the idea of a standard weather day had been developed

taking into account temperature, wind and hours of daylight. In connection with the planning of the 275 kV lines, experience of past loading and outages had been analysed to determine the interconnection capacity (400 MW) required between the north and south of the country. In spite of these uses, it had to be realised that the statistical method had many pitfalls.

PROF. G. A. BARNARD (Imperial College), speaking as a professional statistician, strongly suggested that when important decisions are to be taken on the basis of statistical analysis, the professional statistician should be consulted. His knowledge of the theoretical basis of statistical methods enabled him to avoid their application in unsuitable cases.

MR. G. R. PETERSON (Gen. Op. Eng., B.E.A.) said that the main difficulty in applying statistical methods to generation was that the total number (the population) was so small, so that the necessary basis of randomness did not apply. In working on outage statistics, it was important to remember that if the same trouble occurred in the summer, the engineer concerned would keep the plant out while all possible work was done, whereas in the winter only necessary repairs would be undertaken.

MR. G. H. DANIEL (M.F.P.) expressed surprise that the paper did not mention the technique of analysis of variance, and that more information was not given on statistical sources. The Electricity Commissioners had made a great contribution when they collected their annual returns, but, of course, data requirements had always to be kept under review. Speaking of the care necessary in applying statistics, he dealt with figures for rise in demand for electricity: it could not be assumed that this would always continue, and on a basis of the realised increase in overall fuel consumption (3% per annum) it would soon begin to level off. The overall consumption growth was unlikely to exceed the value quoted.

MR. P. SCHILLER (B.E.A.) claimed credit for the E.R.A. for work in bringing sampling methods to the attention of the electrical supply industry. In connection with sampling methods, he emphasised that what was important for a given accuracy was the absolute size of the sample rather than the percentage it comprised of the whole population. Turning to methods of load analysis and after diversity demand, he suggested that for large numbers of consumers random variations disappeared, and any variations remaining must have real explanations. He dealt at some length with the question of installation design as affected by time distribution of a.d.m.d., and suggested that for some purposes the method of simultaneous equations was of value.

MR. F. H. DENNIS (South Western E.B.) suggested that the method of analysis of variance should not be used alone as the reason for the variance would not be shown. Many factors affected the result of change in tariffs: variations in temperature is especially effective. He thought the simultaneous equation technique could be applied to determine the effect of price changes. So far tariffs had been adjusted on an unscientific basis, and the industry had only obtained increased revenue following tariff changes because the demand had always been growing.

MR. P. H. MARGEN (Kennedy and Donkin) described investigations into generation and transmission capacities, with special reference to plant outages.

MR. D. J. BOLTON (B.E.A.) discussed load factor as a problem in statistical work, with reference to the effect of time (coincidence factor).

MR. E. MEADE (M.-V.) attacked one of the author's illustrations of the use of statistics, and pleaded for a "hard-headed" approach rather than reliance on mathematical forecasts.

The Author replied briefly.

BRITISH STANDARDS

Electric Heating Pads. *B.S.* 1789: 1951. *Price* 2*s*. A further standard in the series devoted to domestic electric appliances, this document deals with electric heating pads and their associated control devices, designed for connection to supply voltages exceeding 30 volts a.c. or 50 volts d.c. but not exceeding 250 volts, a.c. or d.c. Provision is made for two types of pad, namely Type A, normal use (moisture resistant) and Type B, waterproof, with a maximum size in each case, for one side only, of 250 sq in. Details are given of design, construction, joints and connections, temperature control, element enclosure, covers, flexible cord switch, marking, loading and rating. Full tests are included together with details of the instructions which should accompany each pad. Safety precautions have been carefully considered in the preparation of this standard, and work is now in progress on a British Standard for electric blankets.

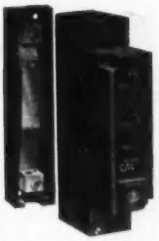
Street Lighting Lanterns *B.S.* 1788: 1951. *Price* 3*s*. This standard is in two parts, the first being devoted to lanterns for electric lighting and the second part to lanterns for gas lighting. Both parts deal with the mechanical and constructional features of lanterns, exclusive of auxiliaries and lamps in the case of electricity. The standard is intended to make for safety, durability and ease of maintenance, but it does not purport to cover photometric requirements. It will be a very useful addition to the Code of Practice for Street Lighting, Part 1 of which will be published shortly.

Extra-low Voltage D.C Cyclic Switches for Aircraft. *B.S. G.*136: 1951. *Price* 1*s*. This covers the requirements for extra-low voltage d.c. electrically-operated switches, with contacts operated in a cyclic manner for use on aircraft. The specification does not include switches used in radio, electronic or telephonic apparatus. The switch contacts may be designed for use on any of the recognised aircraft supply systems.

Copies of the above standards may be obtained from the British Standards Institution, Sales Department, 24 Victoria Street, London S.W.1, at the prices quoted.

Miniature Circuit-breakers

New design developed for general use



D and S 5 amp circuit-breaker and neutral link

THE miniature circuit-breaker with overload trip has long been popular in the United States, where, due to the 110 V l.t. distribution system currents are considerably higher for the same load than in this country. There can, however, be no doubt that this small compact unit has many applications in the British Isles. For that reason, the design recently introduced by Messrs. Dorman and Smith is of general interest. It has been designed to give protection to all types of electrical circuits and equipments up to a maximum rating of 50 amps at voltages up to 500 V a.c. and 250 V d.c. Certified rupturing capacities are 10,000 amps at 250 V d.c., and 10,000 amps at 440 V a.c.; p.f. 0·62 lagging.

Constructional Details

The miniature circuit-breaker consists of two separate units which are known as the main unit and the neutral link unit respectively. Taking the main unit first, this comprises two sub-assemblies—the fixed contact and blow-out device, and the moving contact with its actuating linkage and tripping device; and also the magnetic overload core or time delay unit.

The neutral link is a separate unit fitted underneath the main unit when required, and consists of two spring-loaded silver contacts which are operated automatically by the main moving contact in such a manner that it always closes before, and opens after, the main contacts have operated.

Overload Trip

Operation of the breaker is similar to that of a tumbler switch, with the exception that the tripping mechanism can operate independently of the position of the handle, thus making it impossible to close on to a fault. For instantaneous tripping, a solid iron core is screwed into the moulded base and surrounded by an overload coil connected in series with the main circuit. When the ampere-turns of this coil reach a certain value a hinged armature is attracted by the iron core and the breaker trips. As the tripping is a function of the ampere-turns, the rating of the breaker can be varied by using different coils, and these permit a breaker range tripping at 2·5, 5, 10, 15, 30 and 50 amps. These are standard ratings.

In many cases a delay is required in tripping. This is attained by substituting for the iron core an oil-filled brass tube, containing a spring-loaded iron plunger, the tube being sealed at one end by an iron cap and at the other by a brass cap. Normally the spring holds the plunger against the brass cap, but an overload causes it to rise against the spring into the magnet field, thus increasing the flux attracting the armature and tripping the breaker. Control in these circumstances is exercised by the clearance between the plunger and the cylinder, the viscosity of the oil, the tension of the spring and the clearance between the iron cap and the armature. The time of travel is, however, an inverse function of the current. In practice, constancy is attained in the variables by using a definite clearance, silicone oil, phosphor-bronze springs and the same clearance between cap and armature, thus making the time-delay dependent on ampere - turns and consequently it is a function of coil design.

In the case of large overcurrents, the flux is sufficient to cause operation without the plunger having to move and independent instantaneous operation results.

The normal time delay trip takes a period of 15 to 20 seconds to reset, as the plunger has to move downward through the oil; a version incorporating a valve has, however, been designed to give rapid re-setting.

Fixing

Particular attention has been given to the fixing and assembly of these units. The circuit breaker itself is 5 in high by $1\frac{1}{8}$ in wide by 3 in deep. When the neutral link is required, this increases the depth by $\frac{3}{4}$ in only. The units may if required be fastened directly on busbars, mounted with projection on base plates, or semi-flush mounted. Connections are arranged for front entry, back cable entry, back stud entry, or any combination of these three methods required. Existing prices are 23s. for all sizes of breaker except 50 amperes which are 25s. 3d. Extras available are neutral link, 4s. 6d.; time delay, 2s. 9d.; back stud connections, 1s. 6d. per unit; and quick re-setting plunger, 1s. 6d. per unit.

overseas news

N.S.W. Cuts

Following Victoria's misfortune, New South Wales has now been forced to cut plans for new works drastically. The State Premier, Mr. McGirr, has stated the restriction is due to the 25% cut in the loan programme. Their estimates provided for a total appropriation of £74,518,000, and it was difficult to readjust for much of the equipment had been ordered. The Railways Department will spend £747,000 on White Bay power station and £1,314,000 on the Lake Macquarie generating station. The Electricity Commission, set up by the Government last year, has an allocation of £13,000,000 for the generation and supply of electricity. This year the Commission will spend £5,630,000 on "packaged" power plant for Port Kembla, Penrith, Liverpool, and Maitland; £1,579,000 on diesel power stations; £3,500,000 on the Hume hydro-electric and Pallawarra power stations; and £800,000 on a power station to be erected at Wallerawang.

Another Loan

The State Electricity Commission of Victoria last week launched a new £3 million loan, this time bearing interest at 4⅛%, the new maximum rate fixed by the Loan Council. Mr. R. A. Hunt, chairman of the Commission, said the loan would be an instalment of the £44 million of new capital which the Commission had to obtain this financial year for materials, equipment and labour for the building of power and fuel projects.

Queensland Development

Electrical development by undertakings under public control would cost Queensland about £30 million, the Minister for Mines, Mr. Power, stated last month. This estimate was given in a statement on the State's electricity development, the figure covering work now in hand. Work in all parts of the State was now reaching its peak, and its value was imposing, he said. The first of Queensland's new regional power stations, opened at Howard recently, was only one of the many important projects the State Electricity Commission and the Electricity Supply authorities of the State had in hand. Provided essential equipment and materials came to hand, ample electricity supplies should be available in all parts of the State soon. But some difficulties could be expected in south-eastern Queensland until new generating facilities now under construction were completed.

Snowy Amendment

The Snowy Mountains Hydro-Electric Authority intends to move the site of the proposed Adaminaby Dam on the Eucumbene River five miles further downstream than in the original proposals. It is estimated that this will treble the water storage potential and enable a gain in generating capacity of 330,000 kW—bringing the total for the complete Snowy scheme to around 3,000,000 kW. Adaminaby Dam will be the main storage for the Snowy-Tumut diversion and under the revised arrangement will have total storage of about 3 million acre feet. The water will pass through seven power stations before reaching Blowering Dam and the junction of the Tumut and Murrumbidgee Rivers. This dam will regulate flow for irrigation.

Battle Over Buttle Lake

A battle between hydro-power interests and conservationists over a scenic lake on Vancouver Island has been won by the British Columbia Power Commission, who have been granted permission to dam Buttle Lake for expansion of their plant at Campbell River. The dam will raise the level of the lake by 20 feet, and enable the Campbell River development to be brought up to its maximum capacity of 200,000 h.p.

Winnipeg and Plan "C"

Investigators appointed by the Winnipeg City Council to carry out an investigation into the metropolitan assets of the Winnipeg Electric Co. and of the City Hydro, have now completed their work, and the report is awaited. From this the city council will be able to determine what would be the future earnings of both systems under municipal ownership, as outlined in the Manitoba Government's Plan "C" power proposals. But so far there has been no definite decision as to whether Plan "C" will yet be adopted by the city council.

St. Lawrence Agreement

On Monday an agreement was signed between the Canadian Government and the Provincial Government of Ontario, providing for the development of hydro-electric power in the International Rapids section of the St. Lawrence River, as part of the seaway project to be undertaken by Canada. The Prime Minister later stated that the agreement had been concluded in expectation that the U.S. will not participate in the major project. Under this latest agreement Ontario will undertake the former development work concurrently with an appropriate agency in the U.S., while the navigation works will be carried out by the Canadian Federal Government. There is still a chance, however, that this new proposal would be modified if the 1941 agreement between Canada and the U.S. is eventually approved by Congress and Parliament.

Malta's Optimism

The new generating station under Jesuits Hill, Marsa, will be in commission much earlier than expected, it was stated in Malta recently. Civil engineering works at the power station site will soon be completed, and the erection of the new plant, a good portion of which has already been received, is expected to be taken in hand in the early part of next year. Reconstruction of the existing distribution system will start in the latter part of 1952, and specifications are now being prepared for the new equipment required. With the use of the frequency changer sets at present installed in H.M. Dockyards it will be possible to supply from the new plant during the period of change over from the present distribution system. In addition, a 200 kW generating set has been put into service in Gozo, but the task of extending supplies to outlying villages in the sister Island is proceeding slowly, owing to difficulties in obtaining materials.

Railway Contract

For the electrification of Spain's Manzanares-Baeza-Cordoba railway line, American technical assistance and equipment is to be used, it is announced. Under the terms of the contract with RENEE, the national system of Spanish Railways, the Westinghouse Electric International Co. will supply 20 combination freight and passenger electric locomotives, seven Ignitron rectifier substations, and associated electrical equipment. In addition, the company is to send technical assistance to a Spanish manufacturer, Sociedad Espanota de Construccion Naval, to build mechanical parts for the locomotives and assemble them at the firm's Bilbao factory. The current order is part of a Spanish programme for electrifying key sections of lines where grade, curve and traffic conditions show advantages for electric over steam operation. Electrification of the busy stretch between Manzanares and Baeza is expected to increase its capacity by 65%. Delivery of the 20 locomotives is scheduled for 1954.

Electric Crematorium

The Bombay Municipal Corporation is to erect two electric furnaces at the Chandanwadi crematorium, at a cost of Rs. 236,700. The equipment is being ordered from Denmark. The electric furnaces are being erected in view of the shortage of wood for cremation purposes in the Bombay city. The furnaces, when erected, will be the first of their kind in India.

Research Laboratory

A technical service laboratory was opened a few days ago in a southern suburb of Calcutta by Imperial Chemical Industries. The laboratory, which is designed to assist principally rubber and plastics industries, has some 15,000 sq. ft of floor area, and cost Rs. one million. It has been designed as a combination of miniature factories where manufacturing processes can be faithfully duplicated, and results of research related to factory practice. The opening ceremony was performed by Dr. C. V. Raman, who was welcomed by Mr. N. D. Harris, on behalf of the company. The latter explained that the laboratories would offer training facilities for customers' technical staff, as well as various courses.

Slack Work

Operation of electricity undertakings in Central Africa provides many "incidents" to enliven an otherwise humdrum life, particularly where local labour is employed. The latest to come to our notice concerned oil from two circuit-breakers which was stolen, and eventually found its way into hair pomade! In this particular instance, the c.b. oil was stolen from one of the substations of the Nigerian Electricity Supply Corporation, Ltd. The police tracked down the culprit, the substation attendant (who was convicted and sent to prison for six months) and discovered that the oil was used in hair pomade on sale in Jos market!

Maraeti Progress

The first of five 36,000 kW generators at the Maraetai dam power station is now almost completely installed, we learn, although it will have to wait months yet for water. Another unit has its rotor waiting for installation, and a third is about ready to receive its turbine runner. The dam itself is about three-quarters finished, and at one part has attained its full height of 285 ft. It was only just over a year ago that, after many tribulations, the first concrete was poured for the dam. Since then, in spite of three months when progress was stopped by a strike and a cement shortage, the dam has risen to some 180 ft. above its foundations at the lowest point.

Control Order Amendments ?

Asked for suggestions for amending the N.Z. 1948 Electricity Control Order, the Waitemata Electric Power Board has proposed that it be made compulsory for all supply authorities to adopt the individual quota system of rationing; that quotas should be fixed on a uniform basis for the whole of the North Island; that the control order should provide for penalties for excess consumption; and that authority should be given in the Order for supply authorities to require industrial consumers who wish to use substantial additional blocks of power to install an agreed percentage of stand-by plant.

Expansion

Sanction to borrow a further £10,000 to finance new electricity extension is being sought by the Malvern Electric Power Board, New Zealand. This will complete the board's original proposals for rural electricity distribution initiated in 1948 when a loan of £20,000 was obtained. The engineer-secretary was also authorised to order 50 miles of steel cored aluminium conductor for replacement of existing circuits between Darfield and Sheffield.

PERSONALITIES

IN THE INDUSTRY

The selection of **Mr. J. S. Pickles,** B.SC., M.I.E.E., J.P., as the new chairman of the Yorkshire Electricity Board, in place of Col. W. M. Lapper (as announced by the Minister of Fuel and Power on Monday) will be warmly applauded throughout the electrical industry. For Mr. Pickles has shown brilliant initiative and commendable business acumen in his handling of electricity supply undertakings for many years. He is already familiar with much of his new territory for he served with the former Yorkshire Electric Power Co. for ten years until 1931 when he went to Dumfries as county electrical engineer. His drive there, in carrying out an outstanding scheme of rural electrification, using the single phase system, covering an area of upwards of 1,000 sq. miles, was a major event in electrical history. These matters were the subject of two papers which he presented to the I.E.E. Mr. Pickles was appointed chairman of the South West Scotland Electricity Board on its formation, and was also a member of the Central Authority in 1948-49. He was president of the I.M.E.A. in 1946-47, chairman of the Scottish centre of that association from 1939 to 1941, and chairman of the same centre of E.D.A. in 1942-43. The Minister also stated on Monday that he had accepted Mr. Newey's resignation as from December 1, but had not yet appointed a successor. He did not propose to make any change in the part-time members of the Board. Mr. Pickles assumed his new duties on Tuesday.

Mr. J. S. Pickles

We hear that **Mr. A. C. Day,** A.C.G.I., B.SC., formerly manager of the London office of Turnbull and Jones of New Zealand, has recently returned to New Zealand to fulfil the position of general manager of that company in succession to the late Mr. C. J. Lenihan. In this country **Mr. J. Maitland Jones** has been reappointed London office manager, and has already commenced his duties. He occupied that position for some 27 years before returning to head office four and a half years ago.

Mr. W. Glass, M.I.Mech.E., joint managing director of Johnson and Phillips, Ltd., left this country on the liner *Oronsay* recently for a tour of Australia, New Zealand, Canada and the U.S.A. He intends to visit the Company's branches, agents and associates in those countries, and expects to return to the U.K. in mid-March.

Sub-area engineer, Glasgow sub-area of the South West Scotland Electricity Board for the past 2½ years, **Mr. A. E. Kelly,** A.M.I.E.E., retired at the end of last week. Mr. Kelly gained early training with Cowans, Sheldon and Co., of Carlisle, and Bruce Peebles and Co., Ltd., Edinburgh, before joining the staff of the Glasgow Corporation Electricity Department over 32 years ago. There he served on the power station and substation staff, and at vesting day was assistant substation superintendent. From that time till March 1949, he was construction engineer.

Mr. A. E. Kelly

After 44 years' service, **Mr. John Darke,** C.B.E., M.I.E.E., retired last week from the Post Office regional directorship of the south-west—a position he has held since 1946. His successor is **Mr. L. G. Semple,** C.B.E., B.SC., M.I.E.E., recently regional director for the north-east. Mr. Darke began his career with the old National Telephone Co. During the last war he was at the G.P.O. headquarters in London in charge of the special communication network serving the Forces, Government departments and the air-raid warning system. Mr. Semple started with the G.P.O. Research Station, London, in 1925, and became engineer-in-charge of the Bristol district in 1933-4. He was later promoted back to London, being sent to the U.S. in 1937 on a commission that studied some features of the American telephone system. Since then he has held various posts at home and in Germany, notably as chief engineer of the Home Counties Post Office Region, and as the British Control Commission's director of posts and telecommunications. At Bristol last Thursday, Mr. Darke was the recipient of presentations from his colleagues and friends.

Mr. John Darke

Mr. L. G. Semple

Mr. F. Dunn, a director of Fisher and Ludlow Ltd., is a director of the newly formed concern, Main Refrigeration Ltd.

Assistant to the works director (South) of Crompton Parkinson, Ltd., since April, 1950, **Mr. M. H. L. Lewis,** M.A. (Oxon.), has been co-opted to the board of executive directors of the company. Before taking up his present appointment Mr. Lewis was production liaison officer at the Doncaster Lamp Works. After war service he returned to Oxford to take his degree and in 1947 joined Crompton Parkinson at Chelmsford. Later he served at Guiseley under the works director (North) and carried out special duties in all the C.P. Works throughout the country.

Mr. M. H. L. Lewis

Mr. A. L. Howe, district engineer at Jarrow-on-Tyne for the North Eastern Electricity Board and its predecessor the North Eastern Electric Supply Co., Ltd., has retired after 40 years' service. He has been at Jarrow for 27 years. His retirement has been marked by a gift from the local staff. Mr. Howe's successor is **Mr. J. M. Nicholson,** who has been first assistant to Mr. Howe. Mr. Nicholson joined the former electric supply company in 1922. He was educated at Newcastle Royal Grammar School.

Chief London representative of Keith Blackman Ltd., for the past 14 years, **Mr. J. C. Campbell** retired recently after 50 years' service with the company. His successor is **Mr. D. J. Auld,** who has been with the firm for 27 years, including service at Manchester.

Our accompanying photograph shows **Sir Vincent Ferranti,** of Ferranti Ltd., and **Mr. T. F. Lister,** of Hackbridge and Hewittic Electric Co., Ltd., waiting to board the B.O.A.C. airliner bound for New York a few days ago. They, with Sir George Nelson, represented B.E.A.M.A. at the first International Conference of Manufacturers, organised under the auspices of the European Co-operation Administration, held in New York this week.

Waiting to board the airliner for New York

Sir Percy Mills, managing director of W. and T. Avery, Ltd., and chairman of the National Research Development Corporation, is to act as adviser to the Government in its housing drive, it has been announced by Mr. Macmillan, Minister of Housing and Local Government.

Mr. W. H. Williams

Newly elected president of the Electrical Trades Commercial Travellers' Association for the year 1951-52 is **Mr. W. H. Williams,** a director of the General Electric Co., Ltd., who is well known in the industry. The new chairman of the Association is **Mr. A. Watson,** who has been associated with the electrical trade for many years and is a familiar figure. He represents the General Electric Co., Ltd.

The past two months have marked a busy time for seven senior executives of A.B.O.E., the Engines Division of the Brush A.B.O.E. Group, who, in their travels abroad, have visited over 30 countries to obtain orders and appoint agents. Now in Mexico is **Mr. C. J. Tyndall,** who in the last two months has visited Cuba, Porto Rico, Jamaica, Haiti, Trinidad and the Dominican Republic. The deputy chairman of A.B.O.E., the **Hon. A. C. Geddes,** is shortly returning to India after visiting Spain, Italy, Burma, Ceylon and Malaya, and **Mr. B. H. Mears** is now completing a seven-week survey of sales and service arrangements in Gambia, Sierre Leone, the Gold Coast and Nigeria. **Mr. J. Bradley** is just back in England after visiting Brazil, Bolivia, Chile, Colombia, Ecuador, Peru and Venezuela, and **Mr. I. Macleod Smith** is now in Ethiopia, with Egypt, Aden, Somaliland and Eritrea on his itinerary. **Mr. A. L. Cramb** is now in India after a trip to Burma and Pakistan, and **Mr. F. A. Vaughan** has just left New Zealand and is visiting Fiji and islands in Oceania.

The Rt. Hon. the Earl De La Warr has resigned his directorship of the main board of the Brush Electrical Engineering Co., Ltd., on his appointment as Postmaster-General. **Mr. I. T. Morrow,** late of Robson, Morrow & Co., who has been financial adviser to the group, has been appointed to the board of the Brush Electrical Engineering Co., Ltd. He will act as financial controller to the group. In the summer of 1950 he led the Productivity Team on Management Accounting, under the auspices of the Anglo-American Council on Productivity, on a ten weeks' tour of the U.S. He is a specialist in the installation of budgetary control and standard costs.

Sailing for Sydney, Australia, on December 19, in the Orient liner *Orcades* is **Mr. J. N. Waite,** C.B.E., M.I.E.E., F.Inst.F., who is retiring from the position of divisional controller of the London Division, of the B.E.A. In the latter post, he is succeeded by **Mr. H. V. Pugh,** M.I.E.E., M.I.Mech.E., as we have already noted. Mr. Waite, who is due to arrive at Sydney on January 21, is to advise the Electricity Commission of New South Wales on the power stations in the state which are being taken over by the Commission. These include Bunnerong and Pyrmont, at present operated by Sydney Council. While in Australia his address will be c/o Electricity Commission of New South Wales, Kelvin House, 15 Castlereagh Street, Sydney, N.S.W.

Mr. J. N. Waite

We hear that **Mr. R. G. Mukherji,** M.Sc., Mem.A.I.E.E., A.M.I.E.E., electrical executive engineer Northern Electrical Division, Government of West Bengal, has been nominated local sectional secretary for the year 1951-52 of the Engineering and Metallurgy Section of the Indian Science Congress Association. This Association will hold its 39th session, at Calcutta, early in January, 1952. In gaining his early experience in the electrical industry, Mr. Mukherji spent much time in this country, serving first with Babcock and Wilcox, and later with the Central Electricity Board, and at Brimsdown power station of the Northmet Power Co.

Mr. R. G. Mukherji

OBITUARY

Mr. J. H. Dinwoodie, manager of the Edinburgh branch of British Insulated Callender's Cables, Ltd., died on November 28, aged 50. He had served with that firm and its predecessor for about 35 years, mostly at the Glasgow office, specialising in mining electrification work.

The death occurred on December 2 of **Mr. H. J. Norballe,** aged 80, who was a founder and director of the Watford Electric and Manufacturing Co. Ltd. Born and educated in Denmark, Mr. Norballe spent some time in America, prior to coming to Britain, and starting up in business in Fulham in 1900. But it was not till 1904 that the firm turned to the manufacture of switchgear in connection with which Mr. Norballe became well known throughout the Industry.

It is with regret that we record the death on December 1 of **Mr. A. Vines,** M.A. (cantab), M.I.E.E., aged 84, a founder and chairman of Evershed and Vignoles, Ltd. Mr. Vines had taken an active participation in the day to day business of the company until quite recently, and although he retired from the position of joint managing director in 1940, he retained his seat on the board, and in August, 1940 was elected chairman. He had been associated with the firm and its predecessor since 1891, being appointed works manager of the present concern when it was formed in 1895, and from 1909 till 1940 was a joint managing director. Educated at Emmanuel College, Cambridge, Mr. Vines was a member of the council, management board and conference committee of the Engineering and Allied Employers' National Federation; a vice-president of the British Engineers' Association; vice-chairman of the British Scientific Instrument Research Association. He was also a keen golfer.

Mr. A. Vines

Mr. T. Suckling, formerly assistant fitter with the Folkestone Electricity Supply Co., Ltd., died on November 29.

Mr. John A. Ross, joint managing director of the Ransome and Marles Bearing Co., Ltd., died on November 26. He first joined that concern in April, 1924, as secretary, which position he relinquished in 1936 on being appointed joint general manager. He became a director of the company in 1937, and joint managing director in October, 1941.

Mr. E. J. Davies, M.I.E.E., formerly of Kennedy and Donkin Ltd., died recently. He joined that concern in 1928 and later supervised the construction of the South-west England grid system for the Central Electricity Board. In 1938 he assisted in the preparation of the report on the Central London electricity system, and early in the war took charge of the firm's Glasgow office, where he dealt with designs for extensions to Portobello power station prior to returning to the London office in 1949.

We learn of the death on October 28 of **Mr. B. P. Paul,** aged 59, chairman of the Delhi State Electricity Board. After serving as chief engineer and general manager of the Lahore Electric Supply Co., Ltd. for about 18 years, he joined the Delhi Central Electric Power Authority in September, 1947, as general manager, and took over as its chairman and general manager in July, 1948. He held those offices up to the end of March last, when he was appointed chairman of the Delhi State Electricity Board with which the Delhi Central Electric Power Authority was amalgamated.

The BUYER'S *Column*

Contact Oil

MANY enquiries have been received at these offices for the suppliers of oil similar to that mentioned in "Our Readers' Views" feature in our issue of November 22.

One such contact oil is supplied by the SYNTHETIC CARBON AND ENGINEERING CO., LTD., Cumberland Road, Stanmore, Middlesex. It has been developed and blended for use on fixed and moving contacts of all kinds and is available in fluid or semi-fluid form.

Although in bulk the oil has a good insulation value, a thin film nevertheless enables good contact conditions to be maintained longer than when dry. It is primarily intended for use with base metal contacts and does not affect silver to silver except as a useful lubricant where a wiping action takes place.

Prices for the contact oil, duty paid, range from 4s. for the 2 oz bottle to £2 per gallon for the 5-gallon drums. The semi-fluid oil, duty paid, costs 4s. 6d. per 2 oz tube to £2 10s. per 7 lb container.

Absorption type "Frig" by Main

THE formation of a new company, MAIN REFRIGERATION LTD., to produce an absorption type refrigerator has just been announced by GLOVER AND MAIN LTD., 48 Grosvenor Gardens, London S.W.1.

The new company's refrigerator will be for operation by electricity, town or butane gas and kerosene. It will be made under both Swedish and British patents held on unrestricted licences for the exclusive manufacture, use and sale of the unit not only in the U.K., but also the Dominions overseas and the U.S.

Flue Gas Sampling Equipment

EQUIPMENT designed for testing the nature of flue gases is now available from PRAT-DANIEL (STANMORE) LTD., Dalston Gardens, Stanmore, Middlesex.

Underlying principle involved in the design of the apparatus is that gas under test remains at the same rate of flow as that in the main duct.

The control panel is constructed from aluminium angle sections easily erected and portable. All instruments—flow meter, thermometer, inclined and U gauge—are grouped together as an integral part of the panel, making regulation an easy matter for the testing engineer.

The gas sample is passed through a scrubber, where it is washed, and is drawn off through a flow meter to an exhauster. The sampling nozzle which enters into the gas flue is made of stainless steel and is screwed to the mild steel sampling tube. Rubber steel-lined hose is used for connections between the sampling tube, gas scrubber, panel and exhauster. The latter is of the positive rotary type, driven by a 1 h.p. motor.

After the dust has been collected in the scrubber, it is reclaimed by filtering apparatus, comprising a large washing funnel connected to four porous ceramic filters, mounted in parallel, connected direct to a pump which circulates the water used for washing. The clean water from the filters is pumped back to the washing funnel to be used again. This method enables the washing to be carried out with a small quantity of water.

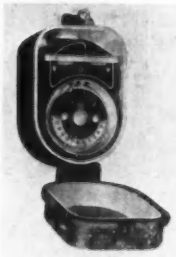
New Nickel Chrome Alloy

WE understand that BRITISH DRIVER HARRIS CO., LTD., Little Peter Street, Manchester 15, in an effort to produce an alloy with a high resistivity and low stable temperature coefficient, have developed a nickel chromium alloy which gives the following values: Resistivity—800 ohms per circular mil-ft. Temperature coefficient—$\pm$0·00002 per degree Centigrade: 20°-100° C.

Although the manufacturers are not yet in production, samples are available from their technical department in sizes down to 0·001 in.

Horstmann Type "Y" Time Switch

NEW development by the HORSTMANN GEAR COMPANY, LTD., of Bath is an electrically wound time switch with spring reserve claimed to be the smallest unit of its type.



Type "Y" is very small

It is known as the Type "Y" and has been specially designed to meet all the requirements of public lighting control, its compact size is a definite advantage when fitted in the base of lamp columns where space is limited.

The movement is fitted into a dustproof case but the complete time switch can be supplied with or without an outer weatherproof metal box.

An 11 jewelled escapement is incorporated, horizontally positioned to give the best possible timekeeping, and a 12-hour spring reserve is included to obviate the necessity for resetting the clock to time after power cuts or failures. It is unaffected by frequency variations.

The unit is of the plug-in type and the switch and clock movement may be removed without disturbing the wiring in any way.

Single pole metal air-break contacts are fitted and a manually operated circuit tester is provided.

The No. 40A weatherproof box has been specially designed for this time switch. It incorporates a top-hinged, quickly detachable cover and the overall dimensions are: height 6$\frac{1}{4}$ in.; width 3$\frac{3}{4}$ in.; depth 3$\frac{1}{16}$ in.

TRADE PUBLICATIONS

CABLES AND EQUIPMENT.—Two new publications received from British Insulated Callenders Cables Ltd., Norfolk St., London, W.C.2, are devoted to television downlead Cables and Mining type straight joint box.

LIGHTING FITTINGS.—New literature from T. B. Morley and Co. Ltd., Jameson St., Hull, deals with the commercial fittings and glass work and other fittings supplied by the firm. The leaflet 33/1151 illustrates a range of decorated glassware, including shades and units with discs, open bottom unit and bowl.

WELDING PLANT.—The Quasi-Arc Co. Ltd., Bilston, Staffordshire, have produced a complete catalogue listing and illustrating the entire range of electrodes plant and accessories which are manufactured for automatic and manual arc welding.

ELECTRICITY IN THE FACTORY. Now being distributed to industrialists and other managements by Falk Stadelmann and Co. Ltd., 91 Farringdon Rd., London E.C.1., are a selection from the publications which they have issued from time to time dealing with electrical equipment especially valuable in the industrial works.

SWITCHGEAR.—The type O.E.3 three tank outdoor oil circuit-breaker manufactured by Cooke and Ferguson Ltd., Victoria St., Openshaw, Manchester, is the subject of catalogue section S.110 now available.

SWITCHGEAR.—Outdoor oil circuit-breakers Type OKH, are described in a new publication from the English Electric Co., Ltd., Stafford.

TELEVISION RECEIVERS.—The model TC 166 television console marketed by E. K. Cole Ltd., Southend-on-Sea, Essex, is featured in an illustrated leaflet recently issued.

RIPPLE CONTROL.—A reprint from *Research* of an article on "Ripple Control" by J. F. Mackenzie of the Automatic Telephone Electric Co., Ltd. Strowger Works, Liverpool 2, has now been published by the company.

ACCESSORIES.—A novel approach to selling is exemplified by illustrated handbills now being issued by Clang Ltd., Crown Yard, Cricklewood, N.W.2. These feature an illustration, accessories in an ornate old "masterpiece" frame. The whole "picture" is marked with a ticket bearing the inscription, "For Sale."

SWITCHGEAR.—The "Spare parts list, medium voltage switchgear type OB3," a new English Electric Co. publication, will prove most interesting to many of our readers. Copies are available from the company's Switchgear Department, East Lancashire Road, Liverpool 10, and other branches.

INSTRUMENTS.—New six-page illustrated folder just published by Dawe Instruments, Ltd., 130 Uxbridge Road, Hanwell, London W.7, summarises the wide range of electronic measuring equipment available from the company.

RELAY TIMING AND CONTROL APPARATUS.—In a neat, concise form that will be acceptable to engineers, the Londex Data booklet gives information on the range of products made by Londex, Ltd., 207 Anerley Road, S.E.20.

Remote Measurement

NEW equipment for the measurement of mechanical quantities electrically and for indicating the results at a distance has been developed by the research laboratories of the GENERAL ELECTRIC CO., LTD., and SALFORD ELECTRICAL INSTRUMENTS, LTD.

Operation is from a.c. mains and the indications can be transmitted directly over several miles.

The basic principle of the system is that of a change of inductance in a circuit, and the inherent difficulties of earlier change-of-inductance systems, due to magnetic leakage, temperature errors and poor electro-mechanical efficiency, have been overcome by the use of an entirely new magnetic powder material "Gecalloy PL."

The powder is moulded and used as the magnetic circuit of an electro-mechanical transducer, which can be regarded as an electrical transformer with a core that is moved about 0·1 in. by the originating mechanical force. The primary winding of the transformer is connected to a.c. mains through a step-down transformer, and the secondary winding is connected to a special dynamometer-type indicator. The indicator and transducer must be used together, as they are designed to be complementary to each other.

The secondary windings of the convertor are placed on the inside of the unit and are connected in opposition after careful balancing, so that the voltage induced in each is neutralised when the moving core is exactly central. Alternatively, the core can be displaced a fixed amount and the windings altered so that the full travel of the core from one end of the gap to the other can be used to increase the range of the instrument. If desired, the core in the centre position can be connected to a centre-zero instrument so that differential measurements can be made. Power consumption is very small and there are no amplifiers to maintain, contacts to keep clean or a multiplicity of moving parts to give trouble.

The indicating instrument is of similar construction to the standard moving-coil switchboard instruments and is normally the flush mounting protected type with a 100° scale. Instruments with 270° scales will be available later. As the movement of the instrument is operated by an a.c. electro-magnet, the resulting torque for the instrument is appreciably greater than that of a comparable d.c. moving-coil instrument.

NEW LITERATURE

The Red Book—Electricity Undertakings of the World

IT is not only the title which is changed in this 61st edition of an old friend—the once familiar 'Tables' have been modified to keep pace with developments and demands. In this volume particulars are again given of the generating stations in the various Divisions of the B.E.A. This is followed by a list of Area showrooms, some information on the North of Scotland Board, personnel with the B.E.A., and more specific district details of the various Area Boards. With this style of presentation there is, of course, a measure of duplication, but this need not necessarily be a drawback to those who will make frequent use of the data. The second half of the volume sets out somewhat similar information concerning British Commonwealth and foreign undertakings, which alone many will consider well worth the price of the book. Published by Benn Brothers, Ltd., Bouverie House, Fleet St., E.C.4., 420 pages, 5¾ in. × 8 in., price 30s.

BOOKS RECEIVED

Encyclopaedia on Cathode Ray Oscillographs, by J. F. Rider and S. D. Uslan. Comprehensive American reference volume. Published by Chapman and Hall, 982 pages, 11 in. by 8 in. Price 75s.

Cathode Ray Oscillographs, by J. Reyner. Relatively simple guide to the practical application of c.r.o.s. Published by Pitman, 199 pages, 7½ in. by 4½ in. Fourth edition, price 15s.

The Electric Current, by P. Dunsheath. Collection of lectures delivered by the author, amplified and illustrated. Published by G. Bell and Sons, 211 pages, 8½ in. by 5½ in. Price 18s. 6d.

Practical Mathematics, Vol. 1, by L. Toft and A. D. D. McKay. First part of a two volume edition which has new chapter on statistics. Published by Pitman, 504 pages, 8½ in. by 5½ in. Third edition, price 20s.

Equipment for Electric Trains

CONSEQUENT on the rebuilding at Witton, the traction control shop of the G.E.C. has been transferred to a new and larger site. Several important contracts for railways in different parts of the world are in hand at the present time, and work is in progress in the new shop on equipment for 3,000 V, 3,030-h.p. locomotives for the South African Railways. The mechanical parts of these locomotives are being built by the North British Loco Co. Ltd.

A further overseas traction contract in hand at Witton is a repeat order from the Estoril Railway, Portugal, for nine 1,500 V d.c. motor coaches, four driving trailers and one trailer. In 1950 the G.E.C. supplied two motor coaches, five trailers and a mixed-traffic locomotive to the same railway, whose chairman, Dr. Antonio de Figueiredo, said in his review of the year that the repeat order had been placed as a result of the confirmation in service of the qualities they had expected to find.

Recently completed is an order for the electrical equipment of eight diesel-electric shunting locomotives for the Ceylon Government Railway, which were designed in association with the North British Locomotive Co.

For service at home, the G.E.C. is supplying the electrical equipment for eight three-car sets of multiple-unit stock for the Sheffield and Wath to Manchester electrification scheme of B.R.

Two views of the Witton shops showing (below) the construction of pantograph collectors for the Manchester-Sheffield stock and (right) traction resistances for the South African Railways

THE WEEK

COMMERCE *in news* INDUSTRY

Mistake over Immersion Heaters

SOME explanation has become necessary following the publication by the Ministry of Supply of the Copper and Zinc Prohibited Uses (M.o.S.) (No. 2) Order. As reported in our issue of last week, the list of goods covered by the new order includes immersion heaters, from which unqualified title it has been reasonably assumed by many that all such heaters are affected. This is however, unintentional as the order was to have applied only to the small portable type of heaters.

Nevertheless, until such a time as an amendment is published, rectifying the situation, all manufacturers of these appliances will have to apply for a licence. A Ministry official stated that a suitable amendment would be passed as early as possible but in the meantime manufacturers of the permanent type of heaters must make application. This should be made to the Ministry of Works, Lambeth Bridge House, Albert Embankment, S.E.1. Licences will be granted automatically to the manufacturers of the permanent types of immersion heaters. The portable types come under the jurisdiction of the Ministry of Supply.

Plan for Tungsten Distribution

IT is expected that the International Materials Conference will approve a long-term plan for the distribution of the (free-) world's tungsten supplies, this week. The programme will probably set the marketing pattern for that material for the next four years, and one of the plan's main objectives will be to increase production of tungsten. This may well be accomplished by a series of pledges under which producing nations agree to supply a set amount and consuming nations to buy a given quantity. These guaranteed market provisions will be accompanied by price clauses. Final approval must come from member Governments.

While both production and purchasing commitments will be made by Governments, the actual contracts for sales of tungsten will be carried out by private producers and buyers. The new plan is particularly significant as it is likely to set a precedent which will be followed by the Conference when it goes about the task of attempting to establish long-term programmes for other commodities.

Details of Exports to Argentine

COPIES of the two circulars specifying goods for which the Argentine Central Bank will consider applications for prior exchange permits for imports from the U.K., have been received by the Board of Trade. As reported in our November 22 issue full details of the circulars have now been published in the *Board of Trade Journal*. Included in the lengthy lists are electric wire and cables, electrical, radio and telephone materials, electronic equipment, lamp fittings and accessories. Importers are allowed until December 10 to apply for exchange quotas by commodity groups, and until January 9 to apply for individual licences for some of the goods. Penalties are provided for failure by importers to use exchange permits once they have been obtained.

Electricity in Wales

DURING the past three years the B.E.A. has spent £48 million in S. Wales towards meeting the greatly increased demand for electricity by industry, and to a lesser extent by domestic consumers. Members of the Welsh Board for Industry were told this in Cardiff last week when Mr. H. J. Bennett, S. Wales Div. Controller of B.E.A., and Mr. T. H. Wood, also of S. Wales Division, attended, and reported on the progress of new power stations.

Many millions of pounds have yet to be spent before the electricity programme in Wales was completed and it was anticipated that output would be doubled during the next few years. Sir Percy Thomas, chairman of the meeting, stated that it was hoped that supply would catch up with demand by 1956. The completion of power stations at Uskmouth and Carmarthen Bay was being delayed to some extent by the universal shortage of steel.

Atomic Power for Electricity

LECTURING to the Norwegian Association of Engineers last Thursday, Sir John Cockroft said that Britain's electric power requirements had increased by 50% since 1940 and was expected to increase again by 45% by 1960. This would require an additional output of 13 million tons of coal.

Britain did not expect that atomic power would be cheaper than that derived from coal, but it was

The First Half-Century

In a contribution to the *Daily Mail*, Mr. Harold B. Gorst laments the arc lighting of the streets, and especially of Battersea Park, on the novel ground that electric light is detrimental to marriage by depriving the masses of the decent shade in which they were wont to woo.—*From our issue of December 5, 1901.*

hoped to produce it at a comparable price. At present the only method of utilising atomic power was by thermal reactors which would take the place of fuel burning furnaces in conventional power stations.

It could be assumed that mobile reactors using highly enriched fuels could be made, and although expensive they could be used for ship propulsion. Aircraft propulsion units were expected to be much more difficult to produce although contracts had been placed for their construction in America.

Windmill Generation in Ulster

SPEAKING at a luncheon in Belfast recently, Mr. D. H. Alexander, principal of Belfast Technical College, spoke of the effect the proposed series of windmills for power generation might have on economy. Two power stations used some 450,000 tons of coal a year, he said, and one such windmill would save about 6,000 tons over the same period. He cited an example in the U.S. which developed 1,250 kW. The electricity sold balanced the cost of erection and the windmill served as a valuable experiment indicating that that sort of thing was possible. The Government of Ulster had been considering various sites for the erection of the windmills and anemometer readings had shown an average wind velocity of 22 m.p.h. The site at Divis, said Mr. Alexander, might well prove to be one of the best in the British Isles.

Electricians' Vital Part

SPEAKING at the Batti-Wallahs' luncheon last Wednesday, Air Chief Marshal Sir Philip Joubert, took as his subject the prospects of "Coastal Command." During the past war one of the great difficulties with which the forces had to cope was the non-standardisation of equipment. Developments in the fields of radio and radar in the U.S. and in this country made it necessary to employ American equipment, and as this was built to American specifications there was a continuous headache due to different plugs and sockets, non-British voltage and frequency and so on. When the European army came into existence the electricians would have a really tough time.

It would be Coastal Command's job to maintain our vital sea-communications, in the face of a massive submarine fleet. There had been a suggestion that Coastal Command should pass into the hands of the Navy. He thought that was entirely wrong. The Navy had no experience of looking after the large machines used, and could not cope with the rapid expansion required.

In the next war, it would be necessary to locate and destroy up-to-date, high speed submarines while they were submerged, if necessary. This would be primarily a job for the electrician. In the last war the Leigh light and radar transformed the U-boat war; in the next we would have to find a method of searching through water.

Hoover Display Winners

THERE were over 900 entries in Hoover Ltd.'s national display contest which has just been completed, and prizes totalling some £800 were awarded. The special challenge cup and first prize of 100 guineas was won by Adams and Jarrett Ltd. of St. Leonards-on-Sea. The competition was divided into three groups: for electricity showrooms, departmental stores and electrical contractors, and first prizes of 50 guineas each went to the Midlands Board at Wolverhampton, E. Mayes and Son, Ltd. of Southampton, and Leonard Colman Ltd. of Coalville (Leicester) respectively. Second and third prizes in these groups amounted to 30 guineas and 20 guineas. Further awards of 15 guineas each were given to winners in the three groups in each of ten areas served by a Hoover branch.

"Old N'Ions" Travelling Bursary

MEMBERS of the Old N'Ions Association who have contributed to funds for a travelling bursary as a 1939-45 War Memorial, will be interested to learn that the first award has been made. The recipient was Mr. W. E. Murphy who has just completed his training at the Northampton Engineering College. The bursary enabled Mr. Murphy to travel through Austria, Switzerland, Italy, Germany and France, working and observing technical procedures and customs in those countries.

Unfair Trading Allegation

THE Midland Electricity Board has been expelled from membership of the Hereford Chamber of Commerce on the grounds of unfair trading in

The winning display in the Ekco National Window Display Competition assembled by Geo. Watson Ltd., of Green Lanes, London N.21. As announced last week this won first prize in both dealers' and students' sections of the contest

Chairman of the Association of Electrical Machinery Trades, Mr. G. H. Holding, addressing his guests at the annual dinner-dance held at the Savoy Hotel recently. The function was reported in our issue of last week

competition with private traders. This decision was made by the Chamber at a meeting last week when it was alleged that the Board was giving extended credit on terms beyond the capacity of the private trader and was using nationalised money to compete in that way. It was stated that repeated allegations of unfair trading had been made to the Chamber. Mr. W. G. Ellson, district manager of M.E.B., said they had not been informed of the matter and had not had notices of meetings sent to them. In Hereford, they had to administer the Board's policy and received no notification of the criticism of trading. Because of this he was not prepared to answer the allegations. The motion for expulsion was approved by 28 votes to one, with two abstentions.

British Success Abroad

BRITISH manufacturers were competing successfully against the Americans in the sale of heavy electrical plant because they studied conditions in foreign countries and made adaptations to meet them, said Mr. H. P. Martin, sales manager of C. A. Parsons and Co., last week. He was speaking at a meeting of the Tees-side branch of the Incorporated Sales Managers' Association. Mr. Martin said there was all the difference in the world between electrical plant for Iraq and for Canada, and whereas British representatives might spend years studying conditions in particular countries, Americans did not study purchaser's requirements. The latter's plant was standardised and their prices higher, he added.

Esher objects to E.T.U. College

IT was agreed at a meeting of the Esher town council last week to refer back a decision on whether to give planning permission for Esher Place to be used as a training college by the E.T.U. The Highways Committee had recommended approval of the change from a girls' school run by Shaftesbury Homes as it would be difficult to envisage an alternative use. Residents on Esher Place estate objected on the grounds that the special and costly amenities of the estate would be affected seriously if the building was used as a residential training college. The building came on the market last July because it was found to be too expensive to run in compliance with the requirements of the Education Act.

OFFICIAL PUBLICATIONS THIS WEEK

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD CONSTRUCTIONAL SCHEME NO. 55. (Concerns Daliburgh Power Station). H.M.S.O., 6d.
An explanatory memorandum has also been issued, H.M.S.O., 2d. (*see page* 1052)

ELECTRICITY SUPPLY (METERS) BILL. H.M.S.O., 2d.
Extends Transitional Provisions until July 1948 (*see page* 1013.)

BRITISH STANDARDS:
B.S. 1788 Street Lighting Lanterns.
B.S. 1789 Electric Heating Pads.
B.S.G. 135, B.S.G. 136, Average Equipment. (*see page* 1036)

E.E.B's Standard Tariff

AT a meeting of Hornsey Chamber of Commerce last week Ald. W. J. Bennett, chairman of Eastern Electricity Consultative Council, spoke of the Area's proposed standard tariff. He said the Board hoped to finalise their plans by the end of the year and the new tariffs should be in operation by April 1.

What Industry Would Like

"WHAT Industry requires from Parliament" was the title of an address Mr. Leslie Gamage, vice-chairman and joint managing director of the G.E.C., gave at the businessmen's meeting of the Empire Industries Association and British Empire League last week. A short answer to that question, he said, was that industry wanted to be left alone. It required general guidance from the Government on its economic policy, and a lead, but not dictation. Mr. Gamage continued by saying that Parliament must at all costs get rid of inflation. How, he asked, could a company quote firm prices when it was ignorant of prices of raw materials and the cost of labour? Turning to taxation, he said it not only took away working capital but also removed all those incentives which breed enterprise and initiative.

Street Lamps for Daytime Too

ATTENTION was particularly directed towards equally good daytime appearance of street lighting schemes when two installations were being planned and erected a short time ago. In the new town of Crawley, designers have been aiming at the most modern and up-to-date methods of construction to make the district a model in all departments. Equipment chosen there were the

Wilton Sieray lanterns each housing two 2 ft 40 W fluorescent lamps. These were mounted on "Tarslag" type 500 columns and brackets. All equipment was supplied by Siemens Electric Lamps and Supplies Ltd., and the installation was carried out by the South Eastern Electricity Board.

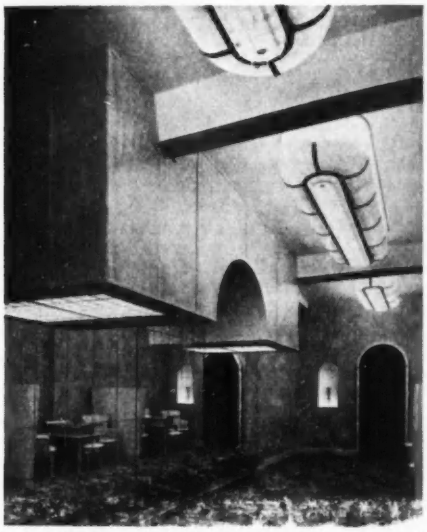
Similar considerations were taken into account at the seaside resort of Southport where it was finally decided to use Metropolitan-Vickers' all-plastic "S.O. Fifty" lanterns. One great advantage of this type is its resistance to injurious effects of salt atmosphere, especially relevant to seaside towns. Over 270 of these lanterns are being used, with 140 W sodium lamps, as well as about 500 "S.S. Fifty-one" lanterns for Group B roads, and when completed, the scheme will be one of the largest of post-war street lighting installations in the north-west.

L.C.C.'s Christmas Lectures

ANOTHER wide range of Christmas lectures has been arranged by the L.C.C. for schoolchildren during the coming holidays. As far as their education in the electrical industry is concerned, perhaps the best lecture on the list is "Steam Driven Electric Power Stations" to be given by Prof. R. O. Kapp, at University College, Gower Street, on January 4. Two others which stand out in the programme are "Television," by Mr. G. Parr, and "The Making and Using of Light," by Mr. L. H. Hubble. The former will be at Norwood Technical College on New Year's day and the second is to be given at Woolwich Polytechnic on January 3.

Women confer on Efficiency

SOME 160 officers from 64 branches of E.A.W. met at Llandudno recently to discuss the efficient use of electricity, particularly in view of the peak-load situation, and also the best methods of carrying out their duties. The conference lasted a week and during that time in long sessions devoted to economy in the use of electricity, many aspects of conditions were discussed. Many of the delegates were also members of Peak Economy Committees, established a short time ago throughout the country. Other subjects dealt with included correct procedure at meetings, ways of carrying out branch work and public speaking.



A view of Cherry Ltd's fashion house where specially designed fluorescent fittings were used and a sloping projection of a former staircase neatly hidden and put to good advantage

Fluorescent Lighting for Fashions

THREE specially designed fittings for fluorescent tubes were used by the G.E.C. in a recent installation for Cherry Ltd.'s fashion showroom. The enclosures are best described by our accompanying illustration, but the contents of each comprises four intermediate white tubes in the centre, above the louvred section, and a concealed double run of tubing has been added in the cornice formed by the body of the fitting. Two of these units are 10 ft long and the third 8 ft 2 in. On one side of the showroom a former staircase has been hidden by the addition of a complementary feature which forms an alcove. Lighting in this part of the room comprises three 2 ft 40 W lamps in each of the two soffits. Contractors were J. Brand Ltd.

Golden Jubilee in Liverpool

THERE is still a month of 1951 to pass, but it is quite safe to say that this year is a memorable

A photograph taken during the dinner-dance of W. T. Glover and Co. Ltd. last week showing Mr. J. L. Ashworth, of N.W. Division, B.E.A. (standing third from left): and then from left to right, Mrs. D. T. Hollingsworth; Sir Joseph Hallsworth, chairman, N.W.E.B.; Mrs. Ashworth; Mr. D. T. Hollingsworth; Miss N. Kenyon, N.W.E.B.; and Mr. J. W. Porter

one for many firms in the electrical industry. A large number have celebrated their jubilees in the past eleven months and not least among them has been the Liverpool Electric Cable Co., Ltd., whose anniversary occurred a short time ago. The celebration of their golden jubilee took the form of a dance at the Grafton Ballroom which was attended by some 700 employees and their friends. The organisation of this function was executed by the social committee and among those present was Mr. W. J. Terry, managing director, and Mr. G. E. Jewell, director.

Care of Small Equipment

A LEAFLET entitled "Care of Small Plant and Hand Tools," the 22nd of a series of advisory leaflets, has just been issued by the Ministry of Works. Briefly, it gives four essential facts for keeping plant and equipment clean and in good condition. Single copies may be obtained from H.M.S.O. at 3d. and there are concessionary rates for bulk orders ranging from 3s. 6d. for 25 copies to £5 for 1,000 copies.

NEWS IN BRIEF

The German Light and Heavy Industries Fairs next year will be held between February 27 and March 2, and from April 27 to May 6, respectively, at Hanover.

In the course of his tour of Lancashire and Cheshire, Sir Basil Brooke, Prime Minister of N. Ireland, spent some time at Ferranti's two factories at Oldham and Moston.

Further to our article (November 22) on the J. Keith Clarke power station, Windsor, Ontario, F. W. Brackett and Co., Ltd. supplied the circulating water screens. This may well be the first instance of English equipment of this kind being used in a Canadian station.

A new branch of E.A.W. has been formed at Solihull. Mrs. G. Hollander was elected chairman.

The Home Secretary announced last week that Summer Time during 1952 will extend from April 20 to October 26.

The F.B.I. has just published a booklet giving a good deal of information on the sponsoring and distribution of industrial films. It is called "Films for Industry," and costs 1s. 8d.

West Lancs, Merseyside and N. Wales Area of E.I.B.A. has arranged a concert to be held at Brookhirst works on December 21. Tickets from G. P. Belsham, Brookhirst Switchgear Ltd., Northgate Works, Chester.

About 150 veterans and serving members of the regiment attended the annual reunion dinner of the Tyne Electrical Engineers' Association last weekend.

Successes of 159 students in the education scheme of B.I.C.C. Ltd. were recognised at the annual presentation of awards held recently at the company's Prescot works.

Mock football matches between a men's fancy-dress team and an all-girl team from Thomas de la Rue and Co.'s Strathendry factory have raised about £100 for Leslie (Fifeshire) Old Folks Committee and R.A.F. Benevolent Fund.

Questions in Parliament

Underground Gasification

Early last week Mr. Geoffrey Lloyd dealt with enquiries about underground gasification projects in Great Britain and abroad. He stated that a scientist of the Department of Scientific and Industrial Research had been working with an American Alabama Power Co. team for the last 2½ years. Work in this country confirmed what had been found in the United States concerning the practicability of power production by underground gasification, but it had not gone far enough to show if such a process would be economic. In reply to Mr. Nabarro, the Minister stated that two coal seams would be ignited at Bayton (the British experimental site) early next year. For technical details he referred the questioner to the Thomas Hawksley lecture of the Institution of Mechanical Engineers (see ELECTRICAL TIMES, November 22, 1951, p. 975).

Meters Bill

The Electricity Supply (Meters) Bill was presented to the House on Thursday by Mr. Geoffrey Lloyd. The Bill is to extend by five years the period, at the expiration of which section three of the Electricity Supply (Meters) Act, 1936, is to cease to apply to any electricity meters. It was due to be read a second time this week.

Technological Education

The Minister of Education stated that it was not possible at present to give the Government's policy on higher technological education. It was, she said, being considered as a matter of great urgency and importance by consultation between herself and those concerned with the subject who were outside the scope of her department.

Illuminated Advertisements

Questioned about illuminated advertising signs in Trafalgar Square, Mr. H. Macmillan said he had not seen any proposals for prohibiting those signs yet. He was further asked whether in the event of proposals for advertising in the Square having to be sent to the Ministry of Works, a full enquiry should be held before any decision was reached. The Minister said he would prefer to wait until there were further developments.

Renewal of B.B.C. Charter

Mr. David Gammans informed the House last week that it was proposed to renew the present B.B.C. Charter and Licence, except for a variation in financial arrangements, for a period of six months. The Government, he said, felt it was impossible to reach final decisions on important

issues involved in time for a new charter and licence to operate from January 1. The renewal would afford reasonable time for examination of terms of a long-term charter and consideration by Parliament. It had been decided to adopt the proposal that the grant to the B.B.C. should be at the rate of 85% of net licence revenue, and that would apply for the extension period. Mr. Profumo pointed out that there was a strong opinion that the new Charter should include provisions for the licensing of alternative broadcasting agencies so that there would be wider and better programmes without further cost and in spite of cuts in revenue. Mr. Gammans said it was desirable that further consideration should be given to that matter.

Supplies to Farms

Asked about electricity supplies to farms, the Minister of Agriculture said some 9,250 farms in England and Wales were supplied with electricity during the year ending September 30, 1951.

Atomic Energy in Industry

Speaking of the progress made hitherto in research stations with the problem of harnessing atomic energy for industrial purposes, Mr. Duncan Sandys said advances had been made in the detailed study of technological problems which had to be solved before the construction of an experimental power reactor could be undertaken. The development of the supply of nuclear fuel and of chemical separation processes was going ahead satisfactorily, he said. Facilities had been established for the production of necessary rare metals. The first stages of work on design studies of experimental reactors for marine propulsion were being concluded, and studies were being made of other types of reactors.

There was an increasing demand for radioactive isotopes for use in industry and improved facilities for production, distribution and training, were being made available. The Minister added that the use of atomic energy for industrial power was still in an early stage of development.

Steel Allocations

Referring to the system of steel allocation, the Minister of Supply stated that the M-form system was used only for sheet steel and tinplate, but it would be applicable to other forms of steel under the new order which was to become operative in February. He could not say the system was watertight but the industry had been consulted and had agreed it was the best in present circumstances.

Coal Output, Imports and Cost

Production of deep mined coal this year was expected to exceed that of 1945 by some 36 million tons, said Mr. Geoffrey Lloyd last week. It was, however, still 30 million tons below what it was in 1937. Production of opencast coal this year would be about 11 million tons. In a written answer the Minister stated that between April and October this year, 435,200 tons of coal were imported from the U.S., 10,100 tons from Canada and 2,400 from Nigeria. Average cost of U.S. coal, including freight, insurance and unloading charges was £6 19s. 8d. per ton.

Building Power Stations

The Minister of Fuel and Power gave an assurance that no reduction in the building programme for new power stations or to extensions for existing stations was contemplated. He added that shortages might compel some postponement.

Stocks of Non-ferrous Metals

Provisional figures for U.K. stocks of sulphur and the principal non-ferrous metals, as at the beginning of last month, were given in the House last week. They were 108,900 tons of sulphur; 122,800, virgin copper; 45,000, refined lead; 35,700, virgin zinc; 64,000, zinc concentrates; and 1,800 tons of virgin tin exclusive of producers' and Government stocks. World supplies of lead were improving and the requirements of British industry should be met next year. Supplies of tin for the U.K. should present no serious problems.

More Questions about Y.E.B.

Having announced the appointment of Mr. J. S. Pickles as chairman of the Yorkshire Electricity Board, Mr. Geoffrey Lloyd, answering questions in the House on Monday, gave further information concerning the reply given on December 4, 1950, by his predecessor. He said that when he met part-time members of the Board he learnt that the officer of the Ministry who was to obtain and check the information may have been aware of the inaccuracy of the answer. He had therefore instituted an immediate investigation which was not yet complete.

Asked about authorisations for work at the Eastern Board's new premises near Ipswich, Whersted House, Mr. Lloyd stated five authorisations had been issued amounting in all to £111,500. He did not know how much had already been spent, and he was prepared to look into the work to ensure that such renovations were justified.

Transmitters in the S.E.

It was hoped to start transmissions from Folkestone early in 1952 to supplement those already working at Brighton, Hastings and Ramsgate, stated Mr. David Gammans. He added that a low-powered transmitter was arranged for a site near Barnstaple and would probably go into operation in the New Year.

Urgent Rural Electrification

The Minister of Fuel and Power was asked if he would increase capital expenditure allocation so that greater progress could be made with urgent schemes of electrification in rural areas. He stated the entire field of national investment was being reviewed at present and, therefore, could not make a statement.

Removal of P.T.

The Financial Secretary to the Treasury was asked whether the Government would consider the removal of purchase tax from household and manufactured goods, with the exception of luxury articles. Replying, Mr. Boyd-Carpenter said it was difficult to define luxury articles, but the matter would be considered before the Budget. There was still the need for revenue, he added.

one for many firms in the electrical industry. A large number have celebrated their jubilees in the past eleven months and not least among them has been the Liverpool Electric Cable Co., Ltd., whose anniversary occurred a short time ago. The celebration of their golden jubilee took the form of a dance at the Grafton Ballroom which was attended by some 700 employees and their friends. The organisation of this function was executed by the social committee and among those present was Mr. W. J. Terry, managing director, and Mr. G. E. Jewell, director.

Care of Small Equipment

A LEAFLET entitled "Care of Small Plant and Hand Tools," the 22nd of a series of advisory leaflets, has just been issued by the Ministry of Works. Briefly, it gives four essential facts for keeping plant and equipment clean and in good condition. Single copies may be obtained from H.M.S.O. at 3d. and there are concessionary rates for bulk orders ranging from 3s. 6d. for 25 copies to £5 for 1,000 copies.

NEWS IN BRIEF

The German Light and Heavy Industries Fairs next year will be held between February 27 and March 2, and from April 27 to May 6, respectively, at Hanover.

In the course of his tour of Lancashire and Cheshire, Sir Basil Brooke, Prime Minister of N. Ireland, spent some time at Ferranti's two factories at Oldham and Moston.

Further to our article (November 22) on the J. Keith Clarke power station, Windsor, Ontario, F. W. Brackett and Co., Ltd. supplied the circulating water screens. This may well be the first instance of English equipment of this kind being used in a Canadian station.

A new branch of E.A.W. has been formed at Solihull. Mrs. G. Hollander was elected chairman.

The Home Secretary announced last week that Summer Time during 1952 will extend from April 20 to October 26.

The F.B.I. has just published a booklet giving a good deal of information on the sponsoring and distribution of industrial films. It is called "Films for Industry," and costs 1s. 8d.

West Lancs, Merseyside and N. Wales Area of E.I.B.A. has arranged a concert to be held at Brookhirst works on December 21. Tickets from G. P. Belsham, Brookhirst Switchgear Ltd., Northgate Works, Chester.

About 150 veterans and serving members of the regiment attended the annual reunion dinner of the Tyne Electrical Engineers' Association last weekend.

Successes of 159 students in the education scheme of B.I.C.C. Ltd. were recognised at the annual presentation of awards held recently at the company's Prescot works.

Mock football matches between a men's fancy-dress team and an all-girl team from Thomas de la Rue and Co.'s Strathendry factory have raised about £100 for Leslie (Fifeshire) Old Folks Committee and R.A.F. Benevolent Fund.

Questions in Parliament

Underground Gasification

Early last week Mr. Geoffrey Lloyd dealt with enquiries about underground gasification projects in Great Britain and abroad. He stated that a scientist of the Department of Scientific and Industrial Research had been working with an American Alabama Power Co. team for the last 2½ years. Work in this country confirmed what had been found in the United States concerning the practicability of power production by underground gasification, but it had not gone far enough to show if such a process would be economic. In reply to Mr. Nabarro, the Minister stated that two coal seams would be ignited at Bayton (the British experimental site) early next year. For technical details he referred the questioner to the Thomas Hawksley lecture of the Institution of Mechanical Engineers (see ELECTRICAL TIMES, November 22, 1951, p. 975).

Meters Bill

The Electricity Supply (Meters) Bill was presented to the House on Thursday by Mr. Geoffrey Lloyd. The Bill is to extend by five years the period, at the expiration of which section three of the Electricity Supply (Meters) Act, 1936, is to cease to apply to any electricity meters. It was due to be read a second time this week.

Technological Education

The Minister of Education stated that it was not possible at present to give the Government's policy on higher technological education. It was, she said, being considered as a matter of great urgency and importance by consultation between herself and those concerned with the subject who were outside the scope of her department.

Illuminated Advertisements

Questioned about illuminated advertising signs in Trafalgar Square, Mr. H. Macmillan said he had not seen any proposals for prohibiting those signs yet. He was further asked whether in the event of proposals for advertising in the Square having to be sent to the Ministry of Works, a full enquiry should be held before any decision was reached. The Minister said he would prefer to wait until there were further developments.

Renewal of B.B.C. Charter

Mr. David Gammans informed the House last week that it was proposed to renew the present B.B.C. Charter and Licence, except for a variation in financial arrangements, for a period of six months. The Government, he said, felt it was impossible to reach final decisions on important

issues involved in time for a new charter and licence to operate from January 1. The renewal would afford reasonable time for examination of terms of a long-term charter and consideration by Parliament. It had been decided to adopt the proposal that the grant to the B.B.C. should be at the rate of 85% of net licence revenue, and that would apply for the extension period. Mr. Profumo pointed out that there was a strong opinion that the new Charter should include provisions for the licensing of alternative broadcasting agencies so that there would be wider and better programmes without further cost and in spite of cuts in revenue. Mr. Gammans said it was desirable that further consideration should be given to that matter.

Supplies to Farms

Asked about electricity supplies to farms, the Minister of Agriculture said some 9,250 farms in England and Wales were supplied with electricity during the year ending September 30, 1951.

Atomic Energy in Industry

Speaking of the progress made hitherto in research stations with the problem of harnessing atomic energy for industrial purposes, Mr. Duncan Sandys said advances had been made in the detailed study of technological problems which had to be solved before the construction of an experimental power reactor could be undertaken. The development of the supply of nuclear fuel and of chemical separation processes was going ahead satisfactorily, he said. Facilities had been established for the production of necessary rare metals. The first stages of work on design studies of experimental reactors for marine propulsion were being concluded, and studies were being made of other types of reactors.

There was an increasing demand for radioactive isotopes for use in industry and improved facilities for production, distribution and training, were being made available. The Minister added that the use of atomic energy for industrial power was still in an early stage of development.

Steel Allocations

Referring to the system of steel allocation, the Minister of Supply stated that the M-form system was used only for sheet steel and tinplate, but it would be applicable to other forms of steel under the new order which was to become operative in February. He could not say the system was watertight but the industry had been consulted and had agreed it was the best in present circumstances.

Coal Output, Imports and Cost

Production of deep mined coal this year was expected to exceed that of 1945 by some 36 million tons, said Mr. Geoffrey Lloyd last week. It was, however, still 30 million tons below what it was in 1937. Production of opencast coal this year would be about 11 million tons. In a written answer the Minister stated that between April and October this year, 435,200 tons of coal were imported from the U.S., 10,100 tons from Canada and 2,400 from Nigeria. Average cost of U.S. coal, including freight, insurance and unloading charges was £6 19s. 8d. per ton.

Building Power Stations

The Minister of Fuel and Power gave an assurance that no reduction in the building programme for new power stations or to extensions for existing stations was contemplated. He added that shortages might compel some postponement.

Stocks of Non-ferrous Metals

Provisional figures for U.K. stocks of sulphur and the principal non-ferrous metals, as at the beginning of last month, were given in the House last week. They were 108,900 tons of sulphur; 122,800, virgin copper; 45,000, refined lead; 35,700, virgin zinc; 64,000, zinc concentrates; and 1,800 tons of virgin tin exclusive of producers' and Government stocks. World supplies of lead were improving and the requirements of British industry should be met next year. Supplies of tin for the U.K. should present no serious problems.

More Questions about Y.E.B.

Having announced the appointment of Mr. J. S. Pickles as chairman of the Yorkshire Electricity Board, Mr. Geoffrey Lloyd, answering questions in the House on Monday, gave further information concerning the reply given on December 4, 1950, by his predecessor. He said that when he met part-time members of the Board he learnt that the officer of the Ministry who was to obtain and check the information may have been aware of the inaccuracy of the answer. He had therefore instituted an immediate investigation which was not yet complete.

Asked about authorisations for work at the Eastern Board's new premises near Ipswich, Whersted House, Mr. Lloyd stated five authorisations had been issued amounting in all to £111,500. He did not know how much had already been spent, and he was prepared to look into the work to ensure that such renovations were justified.

Transmitters in the S.E.

It was hoped to start transmissions from Folkestone early in 1952 to supplement those already working at Brighton, Hastings and Ramsgate, stated Mr. David Gammans. He added that a low-powered transmitter was arranged for a site near Barnstaple and would probably go into operation in the New Year.

Urgent Rural Electrification

The Minister of Fuel and Power was asked if he would increase capital expenditure allocation so that greater progress could be made with urgent schemes of electrification in rural areas. He stated the entire field of national investment was being reviewed at present and, therefore, could not make a statement.

Removal of P.T.

The Financial Secretary to the Treasury was asked whether the Government would consider the removal of purchase tax from household and manufactured goods, with the exception of luxury articles. Replying, Mr. Boyd-Carpenter said it was difficult to define luxury articles, but the matter would be considered before the Budget. There was still the need for revenue, he added.

Electric Supply News

Belfast

The corporation, at its meeting this week, decided to approve an application to the Ministry of Commerce for sanction to borrow £1,025,000 to meet the cost of the second stage of the electricity department's scheme for extending the distribution system.

Douglas

Following some criticism of the revised tariff recently introduced, Mr. C. Anderson, borough electrical engineer and manager, has prepared a report answering the charges. In this he asserts that having regard to the circumstances and size of the undertaking, the cost of electricity in Douglas is very reasonable compared with tariffs in England. After surveying the reason for changes in the tariff, he makes comparison with the South Western Electricity Board's charges, showing that there is a slight balance in favour of Douglas. He then adds that the only method by which Douglas could afford to offer a low power tariff was by increasing the lighting tariff where they had the monopoly. But if they could greatly increase the industrial load it might be possible to reduce the lighting charges.

Newburn-on-Tyne

The B.E.A. has applied to the Minister of Transport for permission to construct a transmission line across the Tyne at Newburn.

Power Station Extensions

The B.E.A. has received the consent of the Ministry of Fuel and Power to extensions to Deptford East and Littlebrook "C" power stations. At the former station, the extension consists of one 52,500 kW turbo-alternator and two 250 k lb/hr boiler units. At Littlebrook "C" the extension comprises one 60,000 kW turbo-alternator and two 360 k lb/hr boiler units.

South Uist

The Secretary of State for Scotland has confirmed a scheme prepared by the North of Scotland Hydro-Electric Board for the construction of a diesel generating station at Daliburgh, South Uist, estimated to cost £52,000. The station will meet the growing demand for electricity in South Uist, which will increase as distribution lines are extended northwards through the island and into Benbecula.

Sutherland

Out of 2,310 agricultural holdings in the county of Sutherland, only 152 had so far taken an electricity supply, Mr. Thomas Johnston, chairman of the North of Scotland Hydro-Electric Board, has stated. In the county of Bute every agricultural holding now had electricity, he said.

In Sutherland the board were working on the expansion of a line from Ullapool to Lichinver and, when the line from Thurso to the Kyle of Tongue was completed there would be a further 800 persons in Sutherland supplied.

Two recent expansions in the county were the Doll area near Brora and the Rhiarchar, Fleuchary, Birchen and Proncy areas near Dornoch. In these areas about 100 crofters would be linked up. Sutherland apart from Caithness was not the worst supplied county on the mainland of Scotland so far as electricity was concerned, Mr. Johnston added. When the £8,000,000 Loch Shin project began next year there would be the opportunity of great development.

Thornaby-on-Tees

The North-Eastern Electricity Board is to reinforce its network at Thornaby Grange estate.

Tipton

After noting a petition signed by local residents, objecting to the proposed extension of Ocker Hill generating station, the Tipton General Purposes Committee has recommended the council to lodge a formal objection to the proposals, with the proviso that the council would be prepared to withdraw the objection on being given an assurance that efficient methods will be used to eliminate the emission of moisture and grit, and to prevent a repetition of the "nuisance" which existed for some time in the area.

Ulster

It is expected that the Ulster Government will shortly publish a scheme for the establishment of hydro-electric stations on the River Bann and the River Mourne. At present, two stations, with a combined output of 20,000 kW are contemplated. The scheme would involve altering the level of Lough Neagh. Surveying in the areas concerned, was completed earlier this year.

Wales

Alderman W. A. Tutton, of Montgomeryshire County Council, met B.E.A. officials on Saturday last to discuss with them the possibilities of dropping the project for a hydro-electric plant at Criggion. He suggested an alternative site.

Mr. J. Warnock, hydro-electric engineer of the Merseyside and North Wales Electricity Board, told the Merioneth section of the County Landowners' Association last week that consumption of electricity in North Wales had increased so quickly that about 80% of the total power had to be imported. It was desirable that North Wales should be dependant on its own resources.

LIGHTING SCHEMES

Swadlincote.—The third stage of the U.D.C.'s scheme for electric street lighting will cost £3,217, involving 97 new columns—a reduction of £564 on the original scheme.

Swindon.—The Streets and Planning Committee has recommended three schemes for improved street lighting, at a total cost of £5,645.

Walton-on-Thames.—The U.D.C. has been told that the M.o.T. has delayed its decision on a scheme for conversion of street lighting to electricity.

Company Activities

Brook Motors Ltd.

Current assets listed in the full accounts total £1,376,733 (*£1,241,032*), including stock and work in progress at £696,991 (*£566,735*). Current liabilities aggregate £471,781 (*£557,232*). Mr. F. V. Brook, chairman, says the production and turnover attained new records, resulting in a much improved profit. Trading total was £556,138 (*£385,333*). A new factory at Barnsley is under construction, and it is estimated that production will commence next spring.

Bullers Ltd.

Trading profit for the year to July 31 last was £365,689 (*£367,137*), which is increased with other income to £370,933 (*£368,887*). After charging depreciation of £22,395 (*£18,662*), taxation £162,168 (*£158,932*), pension for past director £12,282 (*nil*), and other charges, the net profit is £139,270 (*£156,726*). To dividend equalisation reserve £25,000 (*same*), general reserve £99,848 (*nil*), and debenture redemption premium £2,621 (*nil*). The final Ordinary dividend is 10%, making 15% (*same*) on increased capital, and there is £103,882 (*£155,490*) carried forward.

Dowding and Mills

The trading profit for the year to June 30 last is £58,039, compared with £58,441 for the previous twelve months. After charging taxation of £29,578 (*£29,265*), the net profit is £15,032 (*£21,707*). The dividend absorbs £12,453 (*£13,046*), leaving £19,917 (*£17,338*) carried forward.

English Electric Co. Ltd.

Ordinary stockholders are shortly to be offered a rights issue designed to raise a gross sum of £3,243,837. They will be offered 1,179,577 Ordinary £1 shares at 55s. per share, in the proportion of two new shares for every £7 of Ordinary stock held. Underwriting is in progress.

Details have also been released of a private placing (without quotation) of £3,000,000 4½% Debenture stock 1972/77. The new stock, which is being issued at par, will rank *pari passu* in point of charge with the £3,000,000 4% Debenture stock 1965-85 issued publicly last year at 99. A considerable part of this new finance is needed for specific capital projects, notably the construction of a new factory at Netherton, near Liverpool, jointly with the M.o.S. for production of jet engines.

Electric and Musical Industries

Group trading profit for the year to June 30 last jumped to £2,083,526, compared with £756,238 for 1949-50. The group net profit was £663,000 (*£342,809*). Sir Alexander Aikmen, the chairman, attributes the rise in the stock-in-trade and work in progress, listed at £7,552,815 (*£5,421,768*), to the combined effect of the increasing costs of raw materials and the much higher volume of stocks that have to be carried. Current assets total £11,665,308 (*£9,851,099*) and current liabilities £5,316,950 (*£4,330,088*).

S. Smith and Sons (England) Ltd.

Consolidated profit for the year ended August 4 last, before taxation but after charging depreciation, sundry provisions, audit fees, etc., is £1,520,031 (*£1,101,580*). Taxation absorbs £918,368 (*£681,400*), leaving a net profit of £601,663 (*£420,180*). From the parent company's net profit of £452,236 (*£325,012*), the sum of £100,000 is reserved against possible fall in stock values, to general reserve nil (*£150,000*), and pensions nil (*£50,000*). Final Ordinary dividend is 10%, making 12½%, and there is £455,210 (*£251,728*) carried forward.

Dividends Declared

Louis G. Ford.—Interim of 10% (*same*).

Hick, Hargreaves and Co.—Interim of 5% (2%) on increased capital, in accordance with policy of approximating the interim to the final dividend.

Johnson, Matthey and Co.—Interim of 3% (*same*), but on larger capital.

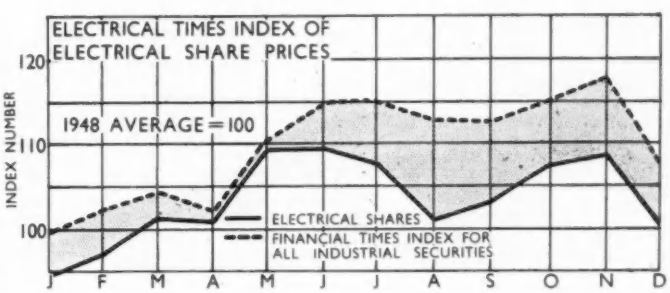
Geo. Kent Ltd.—Interim of 3% (*same*).

Lisbon Electric Tramways.—Interim of 2½%, tax free, payable on January 1.

J. H. Sankey and Son (Holdings).—Interim of 10% (7½%).

Wellman Smith Owen Engrg. Corp.—Interim of 7½% (*same*) on doubled capital.

There has been a sharp fall in all share prices since this graph was last plotted a month ago. At the end of November the "Financial Times" index for all industrial shares had fallen by 10·2 to 107·4, and in a similar way the "Electrical Times" index for electrical shares dropped from 108·6 to 100·3. Figures are based on average prices prevailing during the year 1948


ELECTRICAL TIMES INDEX OF ELECTRICAL SHARE PRICES
1948 AVERAGE = 100
INDEX NUMBER
120
110
100
ELECTRICAL SHARES
FINANCIAL TIMES INDEX FOR ALL INDUSTRIAL SECURITIES
J F M A M J J A S O N D

Commercial Information

CONTRACTS OPEN

HOME

Dec. 8.—Southport T.C. Installation of electric lighting and heating in 50 houses on Heathfield Rd. estate. (Contract 4) Borough Architect and Town Planning Officer, Pavilion Buildings, Lord St. Deposit £1 1s.

Dec. 10.—Cheshire. Electrical work in ten schools. Applications by above date to E. Mainwaring Parkes, county architect, The Castle. Deposit £2 2s. for each contract.

Dec. 10.—Plymouth. Electrical installation in new Technical College. Applications by above date to H. J. W. Stirling, city architect, Seymour Rd. Deposit £3 3s.

Dec. 10.—Pitlochry T.C. Supply and erection of 42 sodium lighting units along A.9. C. Robertson, Town Clerk, Council Chambers.

Dec. 11.—Middleton T.C. Supply and installation of 37 lighting points to be sodium units, and concrete columns, lanterns auxiliary equipment and wiring along main roads; same of 177 lighting points to be tungsten fittings etc. Borough Engineer and Surveyor, Town Hall.

Dec. 12.—Isle of Man. Electrical work for Peel primary school. Architects, Davidson, Marsh and Co., 16-18 Athol St., Douglas. Deposit £1 1s.

Dec. 12.—Monmouthshire. Eastern valleys joint sewerage board invites tenders for eight sets of electrically driven vertical pumps with ancillary equipment. John Taylor and Sons, Artillery House, Westminster, S.W.1. Deposit £5.

Dec. 12.—Stoke-on-Trent. Supply, erection and wiring of 27 concrete columns with lanterns and accessories for mercury discharge lighting scheme along A.53. City Engineer and Surveyor, Town Hall. Deposit £2.

Dec. 14.—Sheffield. Electrical installation at Eccleshall primary infants school. W. Geo. Davies, City Architect, Town Hall. Deposit £2.

Dec. 15.—Slough T.C. Provision of 50 concrete columns and 42 lanterns with low mercury vapour lighting equipment, and erection of 42 columns and lighting installation along Langley Rd. Borough Engineer, Town Hall. Deposit £1 1s.

Dec. 17.—Darlington. Provision and erection of two electric motor and centrifugal pump sets, automatically controlled. Council's Consulting Engineer, Arnold Brooksbank, 14 The Exchange, Bradford. Dep. £2 2s.

Dec. 17.—Hastings T.C. Electrical installation in 98 dwellings on Blacklands Farm estate, Hollington. Borough Engineer, 37 Wellington Sq. Deposit £2 2s.

Dec. 17.—West Riding. Installation of electricity at Swinton Queen St. school. County Architect, Bishopgarth, Westfield Rd., Wakefield.

Dec. 19.—Ealing T.C. Electrical work to lighting system at Ealing grammar school. C. W. Seddon, Borough Engineer and Surveyor, Town Hall, W.5. Deposit £2.

Dec. 19.—Manchester. Supply of (a) synchronous motor driven electric time switches, and (b) tubular type extension boxes for conversion of street lighting gas lamp pillars with auxiliary equipment for lanterns, during year beginning Jan. 1, 1952. City Surveyor, Town Hall. These are separate contracts. (Both advertised in Nov. 29 issue.)

Dec 19 —Fermanagh C.C. Electric heating in Enniskillen Tech. School. Architects at Education Office, 27 High St., Enniskillen.

Dec. 19.—Swindon T.C. Supply and installation of electric cabling, wiring, fittings and equipment for extensions to Rodbourne sewage works. Borough Surveyor, Civic Offices. Deposit £2. (See Nov. 22 issue.)

Dec. 19. — Wandsworth B.C Supply and erection of street lighting equipment for various estates. Borough Engineer, Surveyor and Architect, Municipal Buildings, S.W.18.

Dec. 20 —Sunderland T.C. Electrical installation in extensions to technical college. Architects, G. T. Brown and Son, Barclay Chambers, Fawcett St. Deposit £2 2s.

Dec. 22.—Drumquin (Co. Tyrone.) Electrical heating and lighting in St. Patrick's church and hall. John O'Kane, secretary, parish committee, Drumquin.

Dec. 29.—Cork T.C. Supply of an 8 in. electric bench grinder and a portable electric bench sanding machine, all motors for 3-phase, 380 V 5 c/s a.c. Philip Monahan, City Manager and Town Clerk, City Hall.

Dec. 31.—Staffordshire. Fire Brigade requires supply of electric handlamps. Chief Fire Officer, Brigade H.Q., Pirehill, Aston, Stone.

Dec. 31.—Southgate T.C. Supply of castings (lamp columns, etc.) included in list of requirements during year ending March 31, 1953. J. T. W. Peat, Borough Engineer and Surveyor, Southgate Town Hall, Palmers Green, N.13.

Jan. 1.—Stourbridge. Manufacture, supply and erection of electrically operated centrifugal pumping plant, including electric motors, switchgear, wiring, etc. Geo. P. Deeley, 13 Church St. Deposit £5 5s.

Jan. 2 —Wandsworth B.C. Electric lamps included in list of supplies for year beginning April 1, 1952. R. H. Jerman, Town Clerk, Municipal Buildings, S.W.18.

Jan. 4.—Belfast. Supply and erection of (a) one 7½-ton and one 5-ton overhead travelling crane, one electric lift (2,000 lb capacity), workshop machinery and equipment, self-contained transport weighbridge; and (b) lighting, heating and auxiliary power installations; for harbour power station. Merz and McLellan, consulting engineers, Carliol House, Newcastle-on-Tyne. Deposit £5 5s. each item. (See Nov. 22 issue.)

Jan. 4.—Belfast. Supply and erection of complete coal-handling plant for Victoria power station, including reclaiming transporter, conveyors, automatic weighers and all ancillary equipment. Merz and McLellan, consulting engineers, Carliol House, Newcastle-on-Tyne. Deposit £5 5s. (See Nov. 8 issue)

Jan. 4.—Belfast. Supply and erection of two complete sets of condensate chemical treatment plant for turbo alternators at

Victoria power station. Merz and McLellan, Consulting Engineers, Carliol House, Newcastle-on-Tyne. Deposit £5 5s. Also supply of sundry items in list of annual stores including, switchgear, time switches, static transformers, street lighting equipment, overhead line materials, cables, cookers, etc. Documents from Electricity Dept., East Bridge St., Belfast. Fee, 10s. (Both are advertised in this issue.)

Jan. 5.—Dagenham T.C. Electric lamps and supplies included in list of requirements for year beginning April 1, 1952. Borough Engineer and Surveyor, Civic Centre.

Jan. 14.—Aireborough U.D.C. Supply and installation of (a) columns and brackets, and fitting and wiring of lanterns, and (b) supply of lanterns and all auxiliary gear; for 250 W mercury discharge lighting along 2½ miles of Leeds Rd. Engineer and Surveyor, Council Offices, Micklefield House, Rawdon, nr. Leeds. Deposit £2 2s. (See Nov. 15 issue.)

Jan. 31.—Norwich. Supply and erection of two sets of electrically driven vertical spindle, centrifugal foul sewer pumps and ancillary equipment. City Engineer, City Hall. Deposit £5.

Feb. 1.—Ireland. Supply and erection of hydro-electric generating plant at Inniscarra and Carrigadriod stations on River Lee. Documents from Chief Generation Engineer, Electricity Supply Board, 27 Lower Fitzwilliam St., Dublin C.18. Deposit £5 5s. (See Nov. 1 issue.)

No date stated.—Bucks C.C. Equipment for Slough College of Further Education. D. E. Cooke, Chief Education Officer, County Offices, Aylesbury. (See Nov. 29 issue.)

No date stated.—Fleetwood T.C Electrical installation in 82 houses on West View estate. Applications to Borough Surveyor, Town Hall. Deposit £3 3s.

No date stated.—Guildford T.C. Electrical installation in 150 houses, Bushy Hill, Merrow. Borough Engineer and Surveyor, Municipal Offices, High St.

No date stated.—N. of Scotland H.E. Board. Supply and erection of approximately 47 miles of 22 kV, 10 miles of 11 kV, and 30 miles of l.v. single-circuit wood pole overhead transmission and distribution lines in islands of Benbecula, S.Uist and Eriskay. Engineers, Merz and McLellan, 39 Northumberland St., Edinburgh 3. Deposit £1 1s. (See Nov. 22 issue.)

No date stated.—Perthshire. Electrical work at Aberfeldy Cottage Hospital. Applications to Secretary and Treasurer, Perth Royal Infirmary.

OVERSEAS

*Details of items marked * may be obtained on application to Room 1076, Board of Trade, Thames House, North Millbank, S.W.1, quoting reference.*

Jan. 14.—New Zealand. Supply of some 40,400 yd of cable to various specifications. Director-General (Stores Division) G.P.O. Wellington C.1. B.o.T. (Ref. CRE (IB) 75920/51).*

Jan 17.—New Zealand. Post and Telegraph Dept., Wellington, require supply of various tools and equipment. B.o.T. (CRE (IB) 76557/51).*

Jan. 18.—New Zealand. Post and Telegraph Dept., Wellington, wants electrically operated woodworking machinery. B.o.T. (CRE (IB) 76307/51).*

Jan. 28.—Greece. Complete trunk exchange installation for City of Athens. Information from Telecommunications Organisation of Greece, 15 Churchill St., Athens.

Jan. 31.—Uruguay. Supply and installation of electrical plant and constructures for a sub-supply station and eight reducer substations, transmission cables and plant for telephonic communications. Usinas Electricas y Telefonos del Estado, Montevideo. B.o.T. (Ref. CRE (IB) 76062/51)*

Feb. 12.—New Zealand. Manufacture and supply of twenty 66 kV three-pole airbreak switches, five same with earthing switches, and spares for Islington substation. State H.E. Dept., Wellington. B.o.T. (Ref. CRE (IB) 76308/51).*

Feb. 19.—New Zealand. State H. E. Dept. requires manufacture and supply of single phase potential transformers each 38,100/63.5 V, 1,000 VA, 50 c/s, outdoor type and oil immersed, for Islington substation. B.o.T. (Ref. CRE (IB) 76309/51).*

Feb. 20.—Capetown. Electricity Dept. requires supply of 210 street lighting lanterns, 400 W h.p. mercury lamps, chokes, fuses and condensers; and 150 fluorescent street lighting lanterns with chokes, capacitors, starter units and fuses. Ref. Specification No. 1696/1951.

Feb. 29.—Iraq. Supply and installation of operating machinery for sluices, lock gates, and lifting bridge, at Ramadi. Documents from Coode, Vaughan-Lee, Frank and Gwyther, 9 Victoria St., London, S.W.1. up till Jan. 31.

Your Queries — Answered

"Selectra" drill, makers of? B.T.W.—B. Elliott and Co., Ltd., Victoria Works, Victoria Rd., N.W.10 (22084)

"Thermalux" mattress overlays, makers of? W.J.L.—Thermalux Electrical Products, Ltd., Talbot Works, Lewis St., Halifax. (22093)

"Cytringan" welding machine, makers of? E.D.—Eutalloy and Welding Processes, Ltd., Woodhall Court, Welwyn Gdn. City. (22098)

"Sunshine" fire, makers of? L.B.W.—Falk Stadelmann and Co., Ltd., 91 Farringdon Rd., E.C.1. (22116)

"Walligraph" lamps, makers of? B.E.—Walter Grafton and Sons, Ltd., 122 Foots Cray Rd., S.E.9. (22129)

"Naylor Spiralarm" automatic gas alarms, makers of? T.B.—Naylor Bros, Ltd., Golborne, Lancs. (22132)

The above are selected from questions we have answered this week. If you have a query, send it to us.

FURTHER ANSWER

"Kitman" fluorescent fittings, makers of? T.E.—Drubel Distributors, Ltd., 39a Stafford Rd., Croydon, are sole distributors for these fittings. (22049)

ANSWER WANTED

'Dorchester" fluorescent fittings, makers of? C.J.B.— (22137)

CONTRACTS PLACED

B.E.A. Main and auxiliary power cables, control cables and accessories at E. Yelland, Aberdare Cables Ltd.; Main and auxiliary cables and accessories at Drakelow, B.I.C.C.Ltd.; two 300 k.lb/hr. boilers at Bold, Yarrow and Co. Ltd.; two 300 k.lb/hr. boilers and coal handling plant at Connah's Quay, International Combustion Ltd.; three 350 k.lb/hr. boilers at Clarence Dock, Babcock and Wilcox Ltd.; four 180 k.lb/hr. boilers at Doncaster Mitchell Engineering Ltd.; 132 kV 2,500 MVA switchgear at Skelton Grange, British Thomson Houston Co. Ltd.; two 180 k.lb/hr. boilers at Huddersfield, Bennis Combustion Ltd.; 132 kV overhead line at Stella South, W. T. Henley's Telegraph Works Co. Ltd.; 11.8 kV lower voltage cables at Carrington, B.I.C.C. Ltd.; two 360 k.lb/hr. boilers at Chadderton, Simon-Carves Ltd., One 300 k.lb/hr. boiler at Braehead, Babcock and Wilcock Ltd.; two 120 MVA 275/132 kV Auto-transformers at Slough, G.E.C. Ltd.; 30 MVA 132/33 kV transformers and earthing transformers, at Nelson, Yorkshire Electric Transformer Co. Ltd.; 132 kV overhead line at Devonside-Redhouse, Riley and Neate Ltd. and two 340 k.lb/hr. boilers at Brimsdown, John Thompson Water Tube Boilers.

PRICES OF CABLE METALS AND OTHER MATERIALS
(at Tuesday night)

	£ s. d.	New York price
COPPER, electrolytic	227 0 0	£220 0 0
LEAD, good soft pig (foreign)	175 0 0	152 0 0
,, ,, ,, "English" quality	176 10 0	
Tin (99·99·75%) ... ...(Cash)	935-940	—
,, (3 months)	1012½-1015	—
ALUMINIUM, commercial purity (del.)	124 0 0	—
ZINC	190 0 0	156 0 0
ARMOURING:		
Galv. Steel Wire (0·104 in.)	55 5 0	—
Mild Steel Tape (0·04 in.)	32 5 0	—

GAZETTE ANNOUNCEMENTS

COMPANIES ACTS

Crystal Manufacturing Co. Ltd. Meeting of creditors will be held at Pomeroy House, 28A Basinghall St., E.C.2, on Jan. 7 at 11.30 a.m.

Elexcel Ltd. Resolution for voluntary winding-up passed at meeting on Nov. 20. W. P. Scowcroft and George Davidson Christie of Automatic Telephone and Electric Co. Ltd., Strowger Works, Liverpool 7, have been appointed liquidators.

R. G. Joslin and Co. (Electrical) Ltd. Meeting of creditors will take place at 100 Park St., W.1, on Dec. 12, at 11.30 a.m.

Wembley Electrical Appliances Ltd. Petition for winding-up presented on Nov. 22 and is directed to be heard at Royal Courts of Justice, Strand, on Monday next. Interested persons should communicate with Large & Co., solicitors, 71 Chandos House, Palmer St., S.W.1.

W. Hampton (Stafford) Ltd., electrical contractors, Percy J. Snow of 17 Albion St., Hanley, Stoke-on-Trent, has been appointed liquidator.

BANKRUPTCY ACTS

Receiving Order

Scarborough. Samuel H. Ireland and Vincent Thomason, electrical contractors and radio engineers, trading as "Ireland Thomason and Co." at 61 Market Place, Malton, and 110 Willowgate, Pickering. Date of order, Nov. 22. First meeting at 11 a.m. tomorrow (Friday), at 29 East Parade, Leeds. Public examination at Court House, Castle Rd., Scarborough, on Feb. 5 at 11.45 a.m.

Truro. William D. Newell, radio and electrical engineer, trading at 35 Duke St., Padstow. Date of order, Nov. 23.

Release of Liquidator

London. Kurt Erlach Ltd., spray plant manufacturers of Sidcup, Kent. Liquidator was Stewart Cole, 18 Essex St., Strand, W.C.2.

Application for Discharge

Manchester. William A. Prince and Charles S. Prince, trading as "Prince Bros.," electrical contractors, at 69 Princess St., Manchester. Hearing fixed for 10.15 a.m. on Jan. 14 at the Court House, Quay Street.

Intended Dividends

Burnley. Harold Busfield, electrical engineer, trading at 6 Wilfield St., Burnley. Last day for receiving proofs, Dec. 11. Trustee is F. C. Ormrod, Official Receiver, 20 Byron St., Manchester.

Release of Trustee

London. Archer J. Lapham, trading as Enfield Electrical Supplies, 5 Clock Parade, London Rd., Enfield. Trustee was F. H. Langmaid, Bankruptcy Buildings, Carey St., W.C.2.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, London W.C.2.

Aldridge Welders Ltd., 59 Brick Yard Row, Aldridge. To take over business of electric welders carried on at Aldridge, Staffs, by Geo. L. Carless and W. P. Hickinbotham. Cap.: £1,000. Dirs.: G. L. Carless and W. P. Hickinbotham.

Broughton Installations Ltd., 80 Woodcote Rd., Wallington, Surrey. Electrical contractors and engineers, etc. Cap.: £1,000. Dirs.: F. W. J. B. Pigott, B. Lyon-Williams and F. E. Betteridge.

J. G. Edmiston and Co., Ltd., Mechanical, motor, electrical, oil fuel and constructional engineers, etc. Cap.: £5,000. Dirs.: J. G. Edmiston and Mrs. H.L. Edmiston, Heathway, Virginia Drive, Wentworth, Surrey.

Gulf Trading and Refrigerating Co., Ltd., 7 Albert Ct., Kensington Gore, S.W.7. Proprietors of cold storage accommodation, etc. Cap.: £7,000. Dirs.: C. E. Kendal, D. Brammer and J. H. Yateem.

N.E.B. Tools Ltd., Osborne Rd., Earlsdon, Coventry. Precision, mechanical, motor, aeronautical, electrical, oil fuel, constructional, consulting and general engineers; manufacturers of and dealers in machine tools, etc. Cap.: £1,000. Dirs.: H. G. Empson, W. J. G. Boucher and H. Neale.

TRADE NOTES

Changes of address. The Electric Water Heater Manufacturers Association has moved to 16 Coleman Street, E.C.2. Telephone, Royal 1291.

The P. and B. Engineering Co., Ltd., are now at Crompton Way, Crawley, Sussex.

BUSINESS PROSPECTS

HOME

Batley T.C. Seventy-six houses to be built on Staincliffe estate and 4 on Wilton estate during 1952.

Bradford-on-Avon (Wilts) U.D.C. Layout of Priory Park provides for approximately 52 houses to be built.

Brighton T.C. It is proposed to build factory extensions in Crowhurst Rd. for Skelton, Sleat and Co. Ltd.; office block in Eastern Rd. for P. Lacroix and Son, Ltd., 42 George St. Also, tenders will shortly be invited for erection of 149 dwellings on North Brighton estate.

Caernarvon. Erection of 30 houses at Deiniolen. J. Isgoed Williams, architect and surveyor, Regent House, Penmaenmawr.

Colchester T. C. Construction of 32 dwellings on Shrub End site. J. S. Orchard, Borough Engineer, 64 West Stockwell Street.

Felixstowe U.D.C. Felix Hotel is to be converted for use as offices for administrative staff of about 300.

Gateshead T.C. Plans approved for 825 multi-storeyed flats and maisonettes preparatory to submission to Ministry.

Gravesend T.C. Erection of 43 houses on Westcourt estate. Borough Engineer and Surveyor, 6 Woodville Terrace.

Hammersmith. Scheme approved for development of Caroline estate extension by provision for 90 flats and 44 maisonettes. Architects are E. Armstrong and F. MacManus. Estimated cost, £282,500.

Hastings T.C. Scheme to be prepared for rewiring of Clive Vale school.

Houghton-le-Spring (Durham). The B.D. Case Co., Robinson St., are seeking permission to build a new factory.

Isle of Wight. Plans submitted for approval of secondary modern school at Carrisbrooke. Cost is estimated at £135,104.

Jarrow-on-Tyne. Factory additions proposed for Thermotank Ltd., Bede trading estate. Architects are Cackett, Burns, Dick and MacKellar, 21 Ellison Pl., Newcastle-on-Tyne.

Lincoln. Erection of Riseholme infants' school. Names to A. Sutcliffe, Chief Education Officer, Education Offices, 4 Lindrum Road.

Londonderry. Erection of assembly hall at Magherafelt Technical school. Quantity Surveyor, G. G. Dalzell, Bath St., Portrush.

Loughborough. Approval granted for erection of Women's College of Physical Education at an estimated cost of £140,000.

Mablethorpe and Sutton (Lincs) U.D.C. Construction of 34 houses on three sites. Architects, Watkins, Coombes and Partners, 191 High St., Lincoln.

Middlesbrough T.C. Council is considering report on renovation of Town Hall. Work estimated to cost £6,600 which includes renewal of electrical installation. Also Turner and Ing, 2 Garden St., Darlington, have been appointed quantity surveyors for proposed Middle Beck secondary school.

Newcastle-on-Tyne. Application to be made for sanction to borrow £30,000 for adaptations at Jesmond Dene House as residential school.

Northampton R.D.C. Erection of 50 houses and 8 shops and flats. R. J. Miller, architect, 1 Cheyne Walk.

Northumberland. Preliminary plans prepared for new county school at Newsham. County Architect is C. C. Brown, County Hall, Newcastle.

Northumberland. Standing Joint Committee is to spend £12,375 on erection of police houses in four districts.

Oldham T.C. Site preparations to start soon of Holt's estate where approx. 800 houses are to be built. Borough Engineer is A. L. Hobson.

Onchan, I.O.M. Erection of 44 houses on Ballachrink estate. Architect, J. P. Lomas, Victoria St., Douglas.

Plymouth. It is proposed to build a block of offices at St. Andrew's Cross for Royal Insurance Co. Ltd.

Poole T.C. Construction of 180 houses on Waterloo estate and 38 at Wallisdown. Borough Engineer, Municipal Buildings.

Richmond (Surrey). Plans approved for £22,850 Petersham Russell school, Ham.

Rochdale T.C. Erection of secondary modern school at Kirkholt. Borough Surveyor, Town Hall.

Sale T.C. Construction of 14 houses and 16 flats and also another block of 16 flats on Baguley Lane estate. Borough Surveyor, Town Hall.

Sheffield. Authorisation received for second part of Charles Clifford Dental Hospital for United Sheffield Hospitals Board of Governors.

Shropshire. C.C. has approved erection of an instalment of an infants' school at Whitchurch to cost some £21,500.

Swale R.D.C. Erection of 36 houses at Teynham. Engineer and Surveyor, 48 Bell Rd., Sittingbourne.

Tunbridge Wells T.C. Erection of 55 dwellings on Sherwood estate. H. P. Bishop, borough surveyor and water engineer.

Wandsworth. Erection of 48 flats in five blocks at Southfields. Town Clerk, Municipal Buildings, S.W.18.

Whitfield U.D.C. Erection of 38 houses on Elms estate. Surveyor and Architect, Town Hall.

Worksop. Plans prepared by Elder and Crowe, Architects, London, for a new Town Hall.

Workington T.C. Erection of 72 houses at Northside. Handel Kay, Borough Engineer and Surveyor, "Stoneleigh," Park End Road.

OVERSEAS

Belgium. Armand Gavage, 37-45 rue des Tawes, Liege, wish to contact U.K. manufacturers of immersed pumps equipped with electric motor operated by assistance of air or alternatively equipped with generating set and batteries. Also motor-drive and hand-driven substation pumps.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Birlec (in design). 700,906. Class 11. Apparatus for heating, refrigerating, drying and ventilating, but not including domestic refrigerators, hair-driers or fans. Birlec Ltd., Birlec Works, Tyburn Rd., Erdington, Birmingham.

Columbia (in design). 701,531. Class 9. Radio sets, radio gramophone and television receivers. Columbia Gramophone Co. Ltd., Blyth Road, Hayes, Middx.

Falcon. B695,152. Class 11. Railway rolling stock, tramcars, electric battery driven land vehicles, etc. Brush Electrical Eng. Co. Ltd., Falcon Works, Nottingham Rd., Loughborough, Leics.

MEETINGS TO NOTE

THURSDAY, DEC. 6

I.E.S. (Nottingham Centre).—"Design and Development of New Lighting Fittings." L. W. V. Turner, Elect. Board, Smithy Row, 5.30 p.m.

I.E.S. (Exeter Group).—"Lighting for Prevention of Industrial Accidents." E. W. Murray. Providence Hall, Northernhay St., 7 p.m.

INCORP. PLANT ENGRS. (Peterborough).—"Fire Prevention for Engineers," Eastern Gas Board, Church St., 7.30 p.m.

ELECT. TRADES' COMMERCIAL TRAVELLERS' ASSOC.—Dinner at Windsor Castle Hotel, S.W.1, 6 p.m.

BRITISH INSTN. OF RADIO ENGRS. (Scottish Section).—"Automatic Precision Temperature Recorders incorporating Electronic Potentiometer." C. H. Offord. 39 Elmbank Crescent, Glasgow. 7 p.m.

I.E.E. (London).—"Technical Colleges and Education for Electrical Industry." H. L. Haslegrave. Savoy Place, W.C.2, 2.30 p.m.

A.S.E.E. (S. London Branch).—"I.E.E. Regulations." Col. S. J. Emerson. Cafe Royal, Croydon, 8 p.m.

FRIDAY, DEC. 7

E.P.E.A. (Southern Meter Engrs. Group.) "Induction Operated a.c. Measuring Apparatus." G. P. Baxter. Caxton Hall, Westminster, S.W.1. 6.30 p.m.

I.E.S. (Bath and Bristol Centre).—"Lighting for Prevention of Industrial Accidents." E. W. Murray. S.W.E.B., Colston Ave., Bristol, 6.15 p.m.

I.E.S. (Birmingham Centre).—"Architect's Approach to Artificial Lighting." R. G. Cox. Imperial Hotel, 6 p.m.

I.E.S. (Huddersfield Group).—"Lighting in New House of Commons." C. Dykes Brown. Elect. Showroom, Market St., 7.15 p.m.

INSTN. OF HEATING AND VENTILATING ENGRS. (Manchester Branch).—"Heating and Air Conditioning of the New House of Commons." Engrs. Club, Albert Sq., 6.30 p.m.

BRITISH INSTN. OF RADIO ENGRS. (Merseyside section). — "Multi-Station V.H.F. Communication Systems Using F.M." W. P. Cole and E. G. Hamer. Elect. Showroom, Whitechapel, Liverpool, 7 p.m.

I.E.E. (E. Midland Centre).—"Modern Developments in Electric Welding." H. G. Taylor, Leicester College of Technology, 6.30 p.m.

MONDAY, DEC. 10

E.P.E.A.—"Protection of Electrical Networks and Plant." Mr. Edgeley. Caxton Hall, S.W.1, 7 p.m.

I.E.E. (N.E. Centre).—"Variable-Voltage Generation applied to A.C. Power Systems." R. L. Chantrill, Neville Hall, Newcastle, 6.15 p.m.

I.E.E. (S. Midland Supply and Utilization Group). — "Motive Power in the Factory." H. Dreghorn. Grand Hotel, Birmingham, 6.15 p.m.

I.E.E. (Western Centre).—"Life and Work of Oliver Heaviside." Prof. G. H. Rawcliffe. Inst. of Engrs., Park Place, Cardiff, 6 p.m.

I.E.E. (Reading).—"Heat Pump and its Importance to Electrical Industry." Miss M. V. Griffith. George Hotel, King St., 7 p.m.

I.E.E. (London Students Section).—"Van de Graaff Generator as a Million Volt D.C. Source." D. H. Homis and R. J. Ryan. Savoy Place, W.C.2, 7 p.m.

A.S.E.E. (Central London Branch).—"Air Conditioning and its Applications." H. G. Y. Green. St. Ermin's Hotel, Caxton St., S.W.1, 7 p.m.

A.S.E.E. (N.W. London Branch).—"Variable Speed, a.c. and d.c. Motors." L. W. Marshall. Prince of Wales Hotel, N.W.9, 7.45 p.m.

TUESDAY, DEC. 11

I.E.S. (London).—"Dark Adaptation." W. J. Wellwood Ferguson. 2, Savoy Hill, W.C.2, 6 p.m.

I.E.E. (N. Midland Centre).—"Load Shedding." H. C. Ogden and H. Lloyd. Hotel Metropole, Leeds, 6.30 p.m.

I.E.E. (N.W. Supply Group).—"Protection of Electrical Power Systems." H. Leyburn and C. H. W. Lackey. Engrs' Club, Albert Sq., Manchester, 6.15 p.m.

I.E.E. (N. Ireland Centre).—"Electrical Control of Dangerous Machinery and Processes: Part 2 (Electrically Interlocked Guards on Machines) and Part 3 (Remote Supervisory Control)." W. Fordham Cooper. Presbyterian Hostel, Belfast 6.45 p.m.

I.E.E. (Scottish Centre).—"Nuclear Particle and Radiation Detectors." D. Taylor and J. Sharpe. 39 Elmbank Crescent, Glasgow, 7 p.m.

I.E.E. (London Measurements Section).—"Graphical Analysis for Non-Linear Systems." Miss Pei-Su Hsia. "System Utilising Coarse and Fine Position Measuring Elements Simultaneously in R.P.C. Servo-Mechanisms." J. C. West. Savoy Place, W.C.2, 5.30 p.m.

NEWPORT ELECTRIC CLUB.—"Projection Television." Mr. Butler. Tredegar Arms Hotel, 7 p.m.

A.S.E.E. (S.W. London Branch).—"Branch Lecturettes" at St. George's Hall, St. George's Rd., Wimbledon, 8.15 p.m.

WEDNESDAY, DEC. 12

I.E.S. (Edinburgh Centre).—"Light and Crime." Wm. Merrilees. Lighting and Cleansing Dept., 357 High St., 7 p.m.

BRITISH INSTN. OF RADIO ENGRS. (S. Midlands section).—"Loudspeaker Design." R. T. Lakin. Corporation St. Civic Restaurant, Coventry, 7.15 p.m.

BRITISH INSTN. OF RADIO ENGRS.—N.E. Television Convention at Neville Hall, Newcastle, 6 p.m.

I.E.E. (Mersey and N. Wales Centre. — "Liverpool Overhead Railway." H. M. Rostron. Temple, Dale St., 6 p.m.

I.E.E. (Sheffield sub-centre).—"Operating Experience with High-Pressure Steam Power Plant." W. N. C. Clinch. Grand Hotel, 6.30 p.m.

I.E.E. (N. Lancs sub-centre).—"Standardisation and Simplification in the Electrical Industry." J. T. Moore. N.W.E.B., Darwen St., Blackburn, 7 p.m.

I.E.E. (N.E. Scotland sub-centre).—"Modern Methods of Presentation of Instrument Readings and Recordings." L. B. S. Golds. Caledonian Hotel, Aberdeen, 7.30 p.m.

I.E.E. (London Discussion Circle).—"Activity Methods in Technical Education," opened by R. D. Watts. Savoy Place, W.C.2, 6 p.m.

A.S.E.E. (Coventry Branch).—"Earthing." P. W. Cave. Technical College, 7.15 p.m.

A.S.E.E. (Bradford Branch).—"Science of Electronics." R. A. Challoner. Midland Hotel, 7.30 p.m.

THURSDAY, DEC. 13

I.E.S. (Glasgow Centre).—"Church Lighting." L. C. Retting. 39 Elmbank Crescent, 6.30 p.m.

I.E.S. (Leicester Centre).—"What I Have Learned About Lighting from the Festival." T. O. Freeth. Elect. Showroom, Charles St., 6.30 p.m.

I.E.S. (Manchester Centre).—"Brightness Engineering." W. Robinson. Town Hall Extension, 6 p.m.

INSTN. OF WORKS MANAGERS (Wembley sub-branch).—"Maintenance and the Works Manager." C. J. Peppiatts of G.E.C. Lamp Works. The Plough, Kenton Rd., Kenton, 12.30 p.m.

E.P.E.A. (Merseyside Tech. Group).—"Modern Turbines for use on High Steam Pressure and Temperature." Elect. Showroom, Whitechapel, Liverpool, 7 p.m.

WORCESTER ELECTRIC CLUB.—"Modern Resistance Welding Machines." A. G. Galle. Talbot Hotel, Tything, 7.15 p.m.

INSTN. OF HEATING AND VENTILATING ENGRS. (London Graduates).—"Heating and Ventilating Schools." A. F. Myers and J. C. Weston. 39 Victoria St., S.W.1, 6 p.m.

BRITISH INSTN. OF RADIO ENGRS. (London).—"Electronic Analogues of Physiological Processes." W. Grey Walters and H. W. Shipton. School of Hygiene, Keppel St., W.C.1, 6.30 p.m.

I.E.E. (N. Midland Centre).—"Design of Power Transformers to withstand Surges due to Lighting." A. T. Chadwick, J. M. Ferguson, D. H. Ryder and G. F. Strom. Y.E.B., Ferensway, Hull, 7.30 p.m.

I.E.E. (N.E. Scotland sub-centre).—"Survey of Modern Methods of Presentation of Instrument Readings and Recordings." L.B.S. Golds. Royal Hotel, Dundee, 7 p.m.

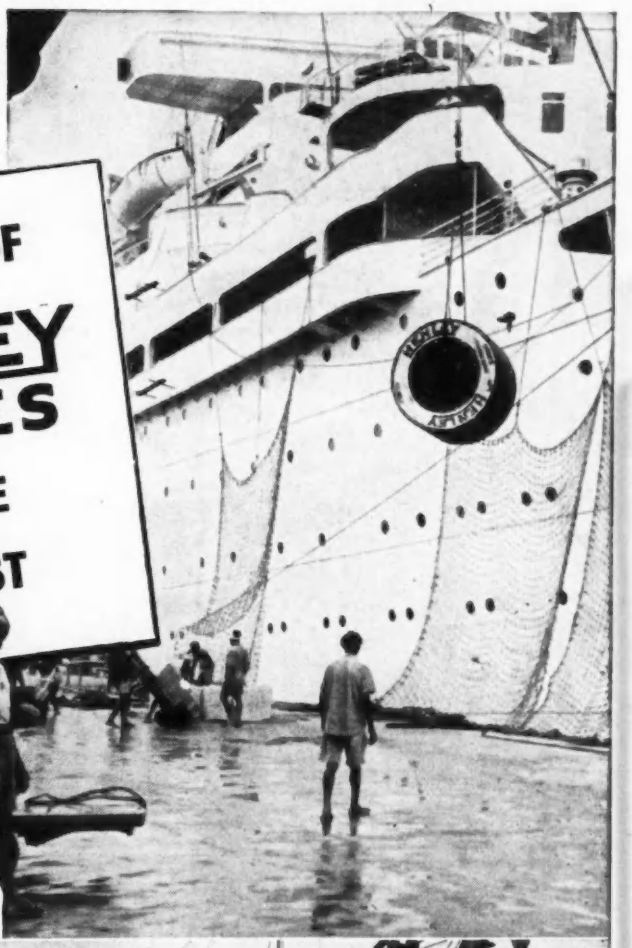
I.E.E. (London Utilisation Section).—"Characteristics and Control of Rectifier-Motor Variable-speed Drives." P. Bingley. Savoy Place, W.C.2, 5.30 p.m.

FRIDAY, DEC. 14

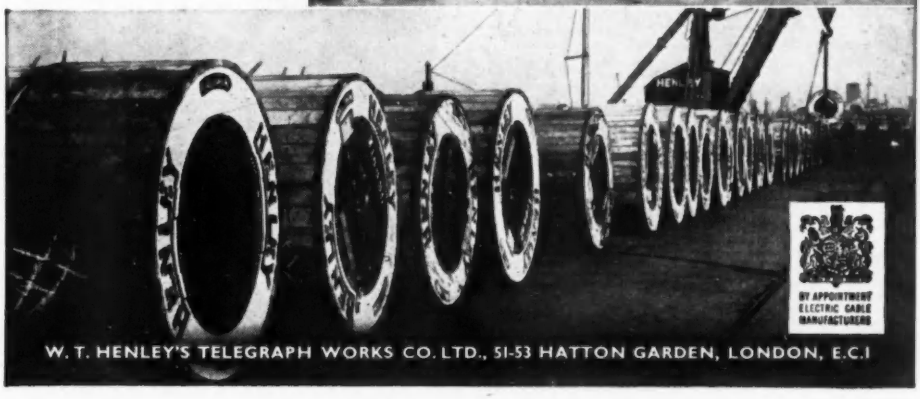
A.S.E.E. (Bristol Branch).—"Lighting—Theory and Practice." R. S. Hazell. Grand Hotel, 7.30 p.m.

A.S.E.E. (Crewe Branch).—"Television." R. V. Peters. Copeland Arms Hotel, Stoke, 7.30 p.m

80 MILES OF HENLEY CABLES FOR THE FAR EAST

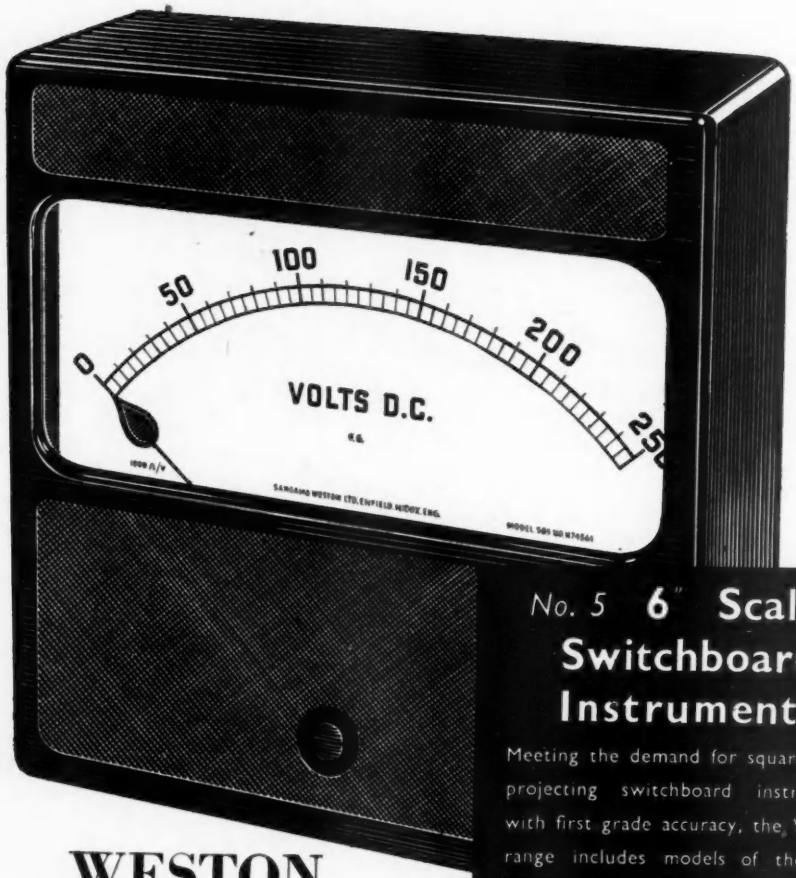


Top picture shows one of the first HENLEY drums of paper cable on the order coming ashore off the "Chusan." The lower picture, taken at our Gravesend Works, shows drums awaiting shipment.



BY APPOINTMENT ELECTRIC CABLE MANUFACTURERS

W. T. HENLEY'S TELEGRAPH WORKS CO. LTD., 51-53 HATTON GARDEN, LONDON, E.C.1



No. 5 6" Scale Switchboard Instruments

Meeting the demand for square cased projecting switchboard instruments with first grade accuracy, the Weston range includes models of the D.C. moving coil, A.C. rectifier and H.F. thermocouple types, as well as the moving iron type. The model S.83 illustrated, is fitted with a 6" scale and pear shaped pointer for ease of reading. Send for details of Weston switchboard instruments. The full Weston range includes panel, switchboard, portable, sub-standard and laboratory standard instruments.

WESTON

Electrical Measuring Instruments

SANGAMO WESTON LIMITED

Enfield, Middlesex. Tel: Enfield 3434 (6 lines) & 1242 (4 lines). Grams: Sanwest, Enfield

Branches: Glasgow, Manchester, Newcastle-on-Tyne, Leeds, Liverpool, Wolverhampton, Nottingham, Bristol, Southampton, Brighton

CLASSIFIED ADVERTISEMENTS

OFFICIAL TENDERS AND APPOINTMENTS

WANTED · FOR SALE WORK WANTED

Those wishing to advertise in these pages should send the text to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia St., London W.C.2, before 10 a.m. on TUESDAY of week of issue. Official Displayed Advertisements are charged at 42s. per inch, and all other classified advertisements at 3s. 0d. per line. Situations Wanted will be published four times for twice the single insertion rate. Fee for Box No. and postage on replies is 2s.

TENDERS INVITED

CITY OF BELFAST

Electricity Department

TENDERS are invited as under:—

LOW-PRESSURE CONDENSATE CHEMICAL TREATMENT PLANT—VICTORIA POWER STATION

The supply, delivery and erection of two complete sets of condensate chemical treatment plant for turbo-alternators, including mixing tanks, pumps, pipework, valves, P.H. records, hydrostatic equipment and all ancillary equipment, the apparatus to be fully automatic and capable of accurate proportioning.

Form of Tender (No. N.1174), conditions and specification, in quadruplicate, may be obtained from Messrs. Merz and McLellan, Consulting Engineers, Carliol House, Newcastle-upon-Tyne 1, on payment of a deposit of five guineas, which will be refunded provided a bona fide tender be lodged and not withdrawn. Extra copies of the contract documents may be obtained at three guineas per set; this sum will not be returnable. Cheques should be made payable to the Belfast Corporation Electricity Department.

Latest time for receipt of tenders, to be lodged in quadruplicate: 4 p.m. on Friday, January 4, 1952.

ANNUAL STORES

The supply and delivery of the following:—

Form No.
1. Turbine Oil.
3. Firebricks and fireclay for high temperature furnace requirements.
5. Carbon brushes.
10. 6,600 V compound-filled armour-clad switchgear.
12. Electricity maximum demand indicators.
13. Automatic time switches.
14. L.T. fuse units, service cut-outs and accessories.
15. Static transformers.
16. Vulcanised bitumen and paper-insulated cables and joint boxes.
21. Electric cookers.
23. Street lighting fittings, steel and concrete poles, and ancillary equipment.
25. Overhead line materials.
26. Mineral insulated copper-covered cables and terminating accessories.
27. Steel conduit and tinned weak-back ferrules.
29. Rubber-insulated cables and flexible cords.
33. Nickel-iron switch tripping batteries and charging equipment.
34. 6,600 V ring-main and switch-fuse units.

Note: Form No. 29 is in respect of materials which shall be supplied to any Department of the Corporation.

Forms of tender, conditions and specifications, in duplicate, may be obtained at the Electricity Department, East Bridge Street, Belfast, on payment of a fee of ten shillings for each set of forms. Extra copies of the contract documents may be obtained at five shillings per set. Cheques should be made payable to the Belfast Corporation Electricity Department.

Tenders, covering letters, catalogues, etc., must be submitted in duplicate, with the duplicate form certified. Latest time for receipt of tenders: 4 p.m. on Friday, January 4, 1952.

The following conditions apply to the above-mentioned tenders:—Each tender, in sealed envelope marked "Tender for . . . Electricity Committee," and endorsed with the name and address of the tenderer, must reach the undersigned not later than the time specified.

An official receipt must be obtained for each tender delivered by hand. Tenders sent by post should be registered.

The lowest or any tender will not necessarily be accepted.

JOHN DUNLOP,
Town Clerk.

City Hall, Belfast.
November 30, 1951. (P 341)

APPOINTMENTS VACANT

EASTERN ELECTRICITY BOARD

Suffolk Sub-Area 123/51 R.

APPLICATIONS are invited for the following appointments:—

(1) SENIOR DEMONSTRATOR AND HOUSECRAFT ADVISOR—Ipswich District;
(2) DEMONSTRATOR—Ipswich District;
(3) DEMONSTRATOR—Bury St. Edmunds District.

Candidates for (1) should have had training and experience in domestic science and electrical housecraft and possess recognised qualifications, preferably including the E.A.W. Certificate and Diploma. Sales experience is also desirable.

Candidates for (2) and (3) must be able to demonstrate and sell domestic electrical apparatus. Recognised qualifications will be an advantage.

The salaries for these appointments will be in accordance with the National Joint Council Salary Agreement, as follows:—

(1) Grade 2 (£440 p.a. by £20 to £500 p.a.).
(2) and (3) Grade 1 (£360 p.a. by £20 to £440 p.a. by £10 to £450 p.a.). Progress beyond £400 p.a. will be subject to a certificate that the person concerned is capable of undertaking all the duties of the grade.

Future salaries and conditions of service will be in accordance with agreements made from time to time by the appropriate negotiating bodies.

The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Applications, stating age, education, qualifications and experience, with details of present appointment and salary, should be submitted to the appropriate District Manager within fourteen days of the appearance of this advertisement.

Addresses of District Managers are as follows: The District Manager—Ipswich, Eastern Electricity Board, Russell House, Russell Road, Ipswich, Suffolk; The District Manager—Bury St. Edmunds, Eastern Electricity Board, 4 Cornhill, Bury St. Edmunds, Suffolk. (P 352)

BRITISH ELECTRICITY AUTHORITY

North Western Division

APPLICATIONS are invited for the following superannuable positions. The salaries are in accordance with the N.J.B. Agreement.

No. 613. SHIFT CHARGE ENGINEER
Agecroft (L.P.) Generating Station

The salary will be £677 to £696 per annum, in accordance with Grade 7, Class "F."

No. 617. ASSISTANT SHIFT CHARGE ENGINEER
Agecroft (H.P.) Generating Station

The salary will be £621 to £648 per annum in accordance with Grade 9, Class "G."

No. 618. STATION SHIFT CONTROL ENGINEER
Agecroft (H.P.) Generating Station

The salary will be £588 to £610 per annum in accordance with Grade 10, Class "G."

No. 619. STATION SHIFT CONTROL ENGINEER
Westwood Generating Station

The salary will be £588 to £610 per annum in accordance with Grade 10, Class "G."

Candidates for all these positions should have had previous experience in a modern generating station and possess suitable technical qualifications.

Applications, quoting vacancy number, stating age, qualifications, present position, and giving full details of education and experience, should be received by the Establishments Officer, British Electricity House, 825 Wilmslow Road, Manchester 20, not later than December 15, 1951. (P 303)

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the position of DISTRICT SENIOR CLERK for the Banbury District.

Applicants should have experience in the control of Consumers' Records and associated matters, contracting, costing and invoicing, payment of wages, meter reading and general clerical and stores work of a district office.

Salary and conditions of service will be in accordance with the National Joint Council, Grade 3, £500 to £560 per annum.

Applications, stating age, qualifications and experience, should be forwarded within 14 days to Sub-Area Manager, Midlands Electricity Board, Whittington, Worcester.

A. STEPHENS,
Secretary.

November 22, 1951. (P 305)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

APPLICATIONS are invited from suitably qualified persons for the following positions:—

242/51—POWER STATION SUPERINTENDENT, Derby.

Candidates for this position should have had considerable experience in the operation and management of a modern Generating Station and should also have had experience of pulverised fuel firing.

The salary will be in accordance with the N.J.B. Agreement, Class "F," Grade "I," Schedule "A."

243/51—ASSISTANT MECHANICAL MAINTENANCE ENGINEER, Staythorpe, nr. Newark.

Candidates should have had a thorough mechanical training and possess considerable experience in the maintenance of all types of Boiler House and Turbine Room equipment found in large Generating Stations. The possession of a recognised technical qualification is desirable.

The salary will be in accordance with Class "J," Grade 6 of Schedule "A" of the N.J.B. Agreement.

244/51—JUNIOR ENGINEERS, Staythorpe

Junior Engineers are required at Staythorpe, where suitable young engineers will be given the opportunity to obtain operating and maintenance experience in the various sections of this large Generating Station operating at 900/900 lbs sq in. steam conditions.

The initial salary will be £393 per annum, in accordance with the N.J.B. Agreement, Class "J," Grade 17, Schedule "A."

Preference will be given to candidates who hold the Higher National Certificate, or who are at present pursuing a course of study with the object of obtaining this or similar qualification.

245/51—THIRD ASSISTANT ENGINEER (Electrical)

Applicants should have had experience in switchgear, electrical auxiliaries, main and multicore cablework, lighting and heating of large power stations, and should possess a Degree or equivalent in Electrical Engineering.

246/51—THIRD ASSISTANT ENGINEER (Mechanical)

Applicants should be thoroughly conversant with all types of plant associated with large Generating Stations, and should be Graduate Members of the Institute of Mechanical Engineers or possess a Degree in Mechanical Engineering or the Higher National Certificate for Mechanical Engineering.

247/51—THIRD ASSISTANT ENGINEER (Civil)

Applicants should hold a Degree in Civil Engineering or be Corporate Members of the Institute of Civil Engineers, and must have had experience in design of heavy foundations, river works, structures in concrete and steel, and other civil engineering works associated with the design of Generating Stations. A knowledge of estimating would be an advantage.

The salaries for Third Assistant Engineers' posts will be within Schedule "C," Class "AX.DX," Grade 5 (£629 to £731 per annum) of the N.J.B. Agreement.

248/51—DRAUGHTSMEN, Transmission Department, Divisional Headquarters

Candidates for this position should have had experience in the design and construction of high-voltage substation or overhead transmission lines.

249/51—ELECTRICAL DRAUGHTSMEN, Transmission Dept., Divisional Headquarters

Candidates should have had general experience on wiring diagrams for large power transformers or high-voltage switchgear, and associated equipment.

The salaries for the posts as Draughtsmen will be in accordance with Grade 5 (£547 to £651 p.a.), or Grade 6 (£413 to £547 p.a.) of Schedule "D," of the N.J.B. Agreement, according to qualifications and experience.

All the above positions will be superannuable within the provisions of the British Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form which may be obtained from the Divisional Establishments Officer, British Electricity Authority, Barker Gate, Nottingham, stating vacancy number, and should be returned to him not later than December 28, 1951.

L. F. JEFFREY,
Divisional Controller.

November 29, 1951. (P 344)

NORTH WESTERN ELECTRICITY BOARD

APPOINTMENT OF GENERAL ASSISTANT ENGINEER (Substations Section)

THE successful applicant will be required to assist with the installation and maintenance of transformers up to 25 MVA; wide range of types of switchgear for all voltages up to 33 kV; mercury arc rectifiers; rotary plant; ancillary equipment of all types.

Salary: Grade M.13, £641 to £651 to £661 p.a. N.J.B. conditions.

Applicants should have had manufacturing experience, including "on-site" erection, and preference will be given to Corporate Members of the Institution of Electrical Engineers.

Applications to Sub-Area Secretary, No. 1 Sub-Area, The North Western Electricity Board, Town Hall, Manchester 2, P.O. Box 493, by December 15, 1951. (P 337)

MIDLANDS ELECTRICITY BOARD

Wolverhampton and District Sub-Area

APPOINTMENT OF SENIOR ASSISTANT ENGINEER (Planning and Technical)

APPLICATIONS are invited for the above position at 83 Darlington Street, Wolverhampton. Applicants should have had wide experience in the general technical work of a large supply undertaking, particularly in the planning of high-voltage transmission and distribution systems. Preference will be given to candidates with suitable technical qualifications.

The conditions of service will be in accordance with the National Joint Board Agreement, and the salary will be Class "J," Grade 4, £1,001 to £1,046 per annum.

Applications, stating age, present salary, full particulars of qualifications, experience and present position, should be endorsed "Planning and Technical Engineer" and forwarded to Mr. F. J. Elliott, Sub-Area Manager, Midlands Electricity Board, 83 Darlington Street, Wolverhampton, within fourteen days.

A. STEPHENS,
Secretary.

November 27, 1951. (P 336)

LONDON ELECTRICITY BOARD

ENGINEERING DRAUGHTSMEN

APPLICATIONS are invited for the above positions in the East Ham and Walthamstow Districts of the North Eastern Sub-Area, although the successful candidates may be required to work in any drawing offices in the Sub-Area.

Candidates should have received good general education and general drawing office experience covering the preparation and maintenance of cable routes, plans and operational diagrams. Experience in preparing layouts of switchgear and building drawings for substations and transformer chambers would be an advantage.

The posts are graded under Schedule D of the National Joint Board agreement as Grade 6, £438 to £574 7s. per annum inclusive of London Allowance, and the commencing salaries will be dependent upon qualifications and experience.

Application forms, obtainable from Establishments Officer, 46 New Broad Street E.C.2, to be returned duly completed by December 22, 1951. Please enclose addressed foolscap envelope and quote Ref. V.1374/T on all correspondence. (P 309)

MIDLANDS ELECTRICITY BOARD

Birmingham and District Sub-Area

APPLICATIONS are invited for the following appointments in the Technical Section of the Birmingham and District Sub-Area:—

High-voltage Planning Section

THIRD ASSISTANT ENGINEER, Class "N," Grade 10, £821 to £848 per annum.

GENERAL ASSISTANT ENGINEER, Class "N," Grade 13, £672 to £693 per annum.

Applicants should have had extensive experience in the preparation of specifications, layout of substations, and the planning of, and analysis of loading conditions on, high-voltage transmission and distribution systems. Appropriate technical qualifications will be considered an advantage.

Medium-voltage Planning Section

JUNIOR ENGINEER, Class "N," Grades 20 to 18, £415 to £507 per annum, according to qualifications and experience.

Applicants should be suitably qualified engineers and have had a good general training in the electricity supply industry.

Applications, stating age, qualifications, present position and experience, should be forwarded within seven days to Emil Braathen, Manager, Birmingham and District Sub-Area, Midlands Electricity Board, 14 Dale End, Birmingham 4.

A. STEPHENS,
Secretary.

November 22, 1951. (P 347)

SOUTH WESTERN ELECTRICITY BOARD

FIRST ASSISTANT DISTRICT ENGINEERS required in the Cornwall Sub-Area as follows:—

(1) West Cornwall District, Camborne.

(2) Central Cornwall District, Falmouth.

(3) South Cornwall District, St. Austell.

Commencing salary £715 p.a. for post (1) and £694 p.a. for posts (2) and (3) within Grade 5 of the N.J.B. Agreement.

The successful candidates will assist the District Engineer on all engineering matters, including preparation of system improvement schemes, supervision of construction work, operation and maintenance of h.v. and l.v. networks. Corporate or Graduate membership of the I.E.E. will be an advantage.

Applications, giving age, present appointment and salary, qualifications and experience, should reach the Sub-Area Manager, Pool, Redruth, Cornwall, within 14 days. (P 304)

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the appointment of PRINCIPAL ASSISTANT to the Section Head in charge of financial accounts at the Board's headquarters.

The post is one of considerable responsibility and calls for large-scale administrative and accountancy experience—preferably in the electricity supply industry.

The duties will include work in connection with the preparation of the Area Board's final accounts together with all associated matters, including taxation and the organisation of accounting within the area. Preference will be given to qualified accountants.

Salary and conditions of service will be in accordance with the National Joint Council Grade 9, £950 to £1,070 per annum.

Applications, giving full particulars of qualifications, age, experience and present salary, should be forwarded within 14 days to the Secretary (Ref. FWC), Midlands Electricity Board, Mucklow Hill, Halesowen, nr. Birmingham.

A. STEPHENS,
Secretary.

November 27, 1951. (P 307)

BRITISH ELECTRICITY AUTHORITY

Southern Division

APPLICATIONS are invited for the following two positions in the Technical Engineer's Department:—

THIRD ASSISTANT ENGINEERS. "AX/DX," 5, £629 to £810.

Applicants should have received a sound technical education and preference will be given to those who are Corporate Members of a senior professional engineering institution or hold qualifications leading to Corporate Membership.

For one position, applicants should have had appropriate experience in the commissioning, maintenance and testing of protective gear and electrical control equipment in substations and generating stations. The successful applicant for the other post will be required to deal particularly with special experimental investigations into technical problems.

Application forms may be obtained from the undersigned and should be returned not later than Friday, December 21, 1951.

P. D. A. OLIVER,
Divisional Secretary.

British Electricity House,
111 High Street,
Portsmouth. (P 342)

BRITISH ELECTRICITY AUTHORITY

APPOINTMENT OF CHEMISTS

APPLICATIONS are invited for the following appointments in the Research Laboratories, Leatherhead:—(I) Grade 5 (General Assistant Engineer), £511 p.a. to £645 p.a., rising to £709 p.a.; (II) Grade 4 (Third Assistant Engineer), £697 p.a. to £827 p.a., rising to £909 p.a.; (III) Grade 3 (Second Assistant Engineer), £775 p.a. to £1,031 p.a., rising to £1,134 p.a.; (IV) Junior Chemists within the Junior Engineer Grade, £375 p.a. to £505 p.a., rising to £586 p.a.

Grades (I) to (III) are subject to confirmation by the N.J.B., and candidates should hold an Honours Degree in chemistry and preferably have research experience in one of the following:—Chemical engineering aspects of coal combustion; ceramics in connection with research and development work on electrical insulation or metallurgical analysis.

Candidates for (IV) should have at least Higher National Certificate in Chemistry or equivalent qualification.

Duties include testing, development and research work in the Laboratories and in the field in connection with generation, transmission and distribution of electricity.

Application forms may be obtained from Applications Section, Ref. AE.221, British Electricity House, Great Portland Street, London W.1, and should be returned to the Director of Establishments not later than December 24, 1951. (P 349)

LONDON ELECTRICITY BOARD

ENGINEERING DRAUGHTSMAN
DRAUGHTSMAN

APPLICATIONS are invited for the following positions in the North Western Sub-Area at Aybrook Street, W.1.:—

(1) Engineering Draughtsman. Candidates should have had a good general and technical education in building construction and architecture, and experience in the design of small buildings in brickwork and reinforced concrete would be an advantage.

The post is graded under Schedule "D" of the National Joint Board Agreement as Grade 6, £438 to £574 7s. per annum inclusive of London Allowance, and the commencing salary will be dependent upon qualifications and experience.

(2) Draughtsman. Candidates should be experienced in the following in relation to distribution systems up to 11 kV: (a) Plant and cable layout work; (b) diagrams; (c) cable surveys and wayleaves.

The post is graded within the National Joint Council Agreement (General Clerical Grade), and the commencing salary would be determined according to age and qualifications up to a maximum of £460 per annum inclusive.

Applications, on forms obtainable from Establishments Officer, 46 New Broad Street, E.C.2, to be returned by December 27, 1951, stating clearly the particular vacancy for which the application is made. Please enclose addressed foolscap envelope and quote Ref. 1382/316/T on all correspondence. (P 345)

CITY OF BULAWAYO

Electricity Department

(1) OVERHEAD MAINS ENGINEER
(2) UNDERGROUND MAINS ENGINEER

Gross commencing emoluments £1,145 per annum, plus Children's Allowances.

APPLICATIONS are invited for the above vacancies and they should be submitted in duplicate, one copy to reach the undersigned not later than January 9, 1952, and the other to Messrs. Merz and McLellan of Carliol House, Newcastle-upon-Tyne. Each application should contain full personal and professional details, and in the case of the copy submitted to the undersigned should be accompanied by an unmounted passport type photograph.

The commencing emolument will be in each case £1,014 10s. rising by annual increments of £39 17s. 6d. to £1,174, plus a standby allowance of £2 per month, children's allowances if applicable, and a transport allowance amounting to £10 18s. 5d. per month. This is based on a salary scale of £878 8s. rising by annual increments of £36 to £1,022 8s. plus a variable Cost of Living Allowance of £136 2s. at the commencement of the Grade and £151 1s. at the top.

Applicants for both these positions should preferably be Corporate Members of the Institution of Electrical Engineers, and have had general experience with a large electricity supply undertaking entailing a degree of responsibility that will enable the successful applicants to organise and control the respective sections in Bulawayo.

In Southern Rhodesia under existing conditions the successful applicant, if married and with two children, would not pay any income tax until the gross salary exceeds £1,120 per annum, excluding transport allowance.

The overhead mains engineer vacancy has already been advertised, but it is being re-advertised owing to certain changes having been made in the gross emolument applicable. Applicants for this vacancy should be capable of designing transmission and distribution lines both electrically and mechanically. They should be conversant with the ordering of materials for overhead electrical transmission schemes, competent to take charge of the erection of such schemes, familiar with schemes employing transmission voltages up to 66 kV and capable of carrying out switching operations together with modern methods of fault localisation and rectification.

Applicants for the underground mains engineer vacancy should have a thorough knowledge and experience of modern heavy switchgear practice, supertension cables, and modern protective practice. They should be familiar with schemes employing transmission voltages up to 33kV.

The children's allowance applicable to all vacancies is £30 per annum for the first child and £24 per annum for each of the next two children.

The successful applicants, if under the age of 50 years after serving a satisfactory probationary period of twelve months, will be required to join the pension fund on obtaining a satisfactory certificate from the Council's Medical Officer of Health.

The appointments will be subject to the Council's service, leave and sick leave regulations. Further details, if required, are available on application to Messrs. Merz and McLellan, Carliol House, Newcastle-upon-Tyne.

H. J. COOK,
Town Clerk.

P.O. Box 591,
Bulawayo,
Southern Rhodesia.
November 26, 1951. (P 311)

YORKSHIRE ELECTRICITY BOARD

APPLICATIONS are invited for the following appointment:—

No. 6 (Hull) Sub-Area

GENERAL ASSISTANT DISTRICT ENGINEER
(Goole) (Vacancy No. 161/51)

Applicants should have had experience in the operation and construction of 11 kV and l.t. overhead lines, including pole-mounted substations, for rural electrification. They should also be competent to carry out overhead line surveys, preparation of route plans, supervision of linesmen and erection of overhead lines. Knowledge of underground networks will be an advantage.

Preference will be given to Corporate Members of the Institution of Electrical Engineers, or holders of the Higher National Certificate.

The successful candidate will be required to reside in Selby and carry out standby duties.

Salary: N.J.B. Agreement, Class "D," Grade 11, £480 to £497 per annum.

Applications, stating the above vacancy number, and giving full details of age, qualifications, and experience, should be forwarded to the Manager, No. 6 (Hull) Sub-Area, Yorkshire Electricity Board, Ferensway, Hull, within fourteen days of the appearance of this advertisement. (P 338)

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments:—

Chilterns Sub-Area 121/51 R.

(i) Luton District:
TWO THIRD ASSISTANT ENGINEERS
(ii) Bedford District:
ONE THIRD ASSISTANT ENGINEER;
(iii) Aylesbury District:
TWO GENERAL ASSISTANT ENGINEERS.

Candidates should have had a sound technical training and experience in the construction, operation and maintenance of urban and rural distribution systems.

The salaries for these appointments will be in accordance with the National Joint Board Salary Agreement as follows:
(i) Class "G," Grade 9, commencing at £621 per annum;
(ii) Class "F," Grade 9, commencing at £587 per annum;
(iii) Class "E," Grade 11, commencing at £504 per annum.

Apply as follows:—
(i) The Manager—Luton District, Eastern Electricity Board, Electricity Offices, 487 Dunstable Road, Luton, Beds.
(ii) The Manager—Bedford District, Eastern Electricity Board, Electricity Offices, Prebend Street, Bedford.
(iii) The Manager—Aylesbury District, Eastern Electricity Board, Electricity Offices, Exchange Street, Aylesbury, Bucks.

Essex Sub-Area 98/51 R.

Sub-Area Headquarters, near Brentwood

SENIOR ASSISTANT ENGINEER (CONSTRUCTION)

Candidates should have had a sound technical training and be fully experienced in the supervision of the construction of substations and equipment, overhead and underground mains up to 33 kV and associated civil engineering work. Candidates should also possess an Engineering Degree or be Corporate Members of the Institution of Electrical Engineers.

The salary will be in accordance with Class "K," Grade 4 of the National Joint Board Salary Agreement, commencing at £1,068 per annum.

Apply to the Manager, Essex Sub-Area, Eastern Electricity Board, "Millfield," Bentley, nr. Brentwood, Essex.

Fens Sub-Area 120/51 R.

Sub-Area Headquarters, Milton Hall, Cambridge

THIRD ASSISTANT ENGINEER
(Planning and Development Section)

Candidates should have had a sound technical training and experience in the design, layout and operation of urban and rural distribution systems at voltages up to 33 kV.

The salary for the appointment will be in accordance with Class "G," Grade 10, of the National Joint Board Salary Agreement, commencing at £588 per annum.

Apply to the Manager, Fens Sub-Area, Eastern Electricity Board, Milton Hall, Milton, Cambridge.

Future salaries and conditions of service for the above appointments will be in accordance with agreements made from time to time by the appropriate negotiating bodies.

The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Applications, stating age, education, qualifications and experience, with details of present appointment and salary, should be submitted to the person concerned within fourteen days of the appearance of this advertisement. (P 289)

SOUTH EASTERN ELECTRICITY BOARD

DEMONSTRATOR—Purley District

SALARY of £360 to £450 p.a. under N.J.C. Agreement, Grade 1, plus London Weighting. Superannuation will be arranged. Applicants must be experienced in demonstrating to consumers in their own homes all types of domestic electrical appliances, and be able to organise and conduct public lectures and demonstrations. Appropriate domestic science or housecraft qualifications an advantage.

Applications, on forms obtainable from J. McAlister, B.Sc., A.M.I.E.E., Purley Manager, SEEBoard, Electric House, High Street, Purley, Surrey, to be returned by December 17, 1951.

A. L. BURNELL,
Secretary.
November, 1951. (P 343)

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the appointment as ORGANISATION AND METHODS OFFICER in the Audit and Organisation Section of the Chief Accountant's Department at Board Headquarters.

Applicants should preferably be qualified accountants and have had considerable experience in office methods and procedures and the use of office appliances, in large concerns.

The appointment will be subject to the conditions of the National Joint Council (Administrative and Clerical Grades) for the Electricity Supply Industry, and the salary will be within Grade 9, £950 to £1,070.

The successful candidate will be required to contribute to the Board's Superannuation Scheme if eligible.

Applications, giving full details of qualifications, age, experience and present salary, should be forwarded within 14 days to the Secretary (ref. FWC), Midlands Electricity Board, Mucklow Hill, Halesowen, nr. Birmingham.

A. STEPHENS,
Secretary.
November 27, 1951. (P 306)

BOROUGH POLYTECHNIC

Borough Road, S.E.1

DEPARTMENT OF ELECTRICAL ENGINEERING AND PHYSICS

THE GOVERNORS invite applications from suitably qualified candidates for appointment as an ASSISTANT LECTURER to teach electrical installation work leading to the Course B and Course C examinations of the City and Guilds of London Institute. Preference will be given to candidates holding a City and Guilds Certificate in the subject and with experience in electrical contracting. Some teaching experience is desirable.

The post will be classified either as a Grade A or a Grade B Assistantship under the Burnham (Further Education) Report, 1951, depending upon the qualifications and experience of the successful candidate. The basic salary will be supplemented by the appropriate London Allowances.

Further particulars and forms of application may be obtained by sending a stamped addressed foolscap envelope to the undersigned.

DOUGLAS H. INGALL,
Principal.
(P 286)

BRITISH ELECTRICITY AUTHORITY

South Wales Division

Vacancy No. 109/51

APPLICATIONS are invited for the following superannuable appointments at the new Uskmouth Power Station, near Newport:—
(1) POWER STATION SUPERINTENDENT
N.J.B. Class "K," Grade 1 (£1,379 to £1,442).
(2) MAINTENANCE ENGINEER (ELECTRICAL)
N.J.B. Class "K," Grade 6 (£911 to £952).

The classification will eventually be raised to Class "L."

Applicants for appointment (1) should have had considerable experience in the operation, maintenance and administration of a modern generating station, including experience of pulverised fuel. Preference will be given to Corporate Members of the Institution of Mechanical Engineers and/or Institution of Electrical Engineers, or those who hold equivalent qualifications.

For (2) applicants should have wide experience in power station electrical maintenance and should preferably be Corporate Members of the Institution of Electrical Engineers or hold equivalent qualifications.

Application forms, obtainable from the Divisional Secretary at the address below, should be returned by December 31, 1951.

H. J. BENNETT,
Divisional Controller.
British Electricity Authority,
Cardiff (Pengam Moors) Airport,
Cardiff.
November 29, 1951. (P 348)

LONDON ELECTRICITY BOARD

DEVELOPMENT ASSISTANT

APPLICATIONS are invited for the above position in the North Western Sub-Area at Willesden, N.W.2.

Applicants are required to have a knowledge of service to consumers, tariffs and their application. They should be familiar with electrical apparatus and be capable of advising consumers on domestic and small commercial and industrial installations. The possession of the E.D.A. Salesmanship Certificate would be considered an advantage.

The post is graded within the National Joint Council Agreement (Administrative and Clerical Grades) as Grade 1, i.e. £360 to £450 per annum, plus the appropriate London Allowance.

Application forms, obtainable from Establishments Officer, 46 New Broad Street, E.C.2, to be returned, duly completed, by December 17, 1951. Please enclose addressed envelope and quote Ref. V/1361/T on all correspondence. (P 350)

LONDON ELECTRICITY BOARD

ENGINEER (TEST)

APPLICATIONS are invited for the above position in the meter and testing branch of the Western Sub-Area, based at Fulham S.W.6, although the successful applicant will be required to work in any district of the Sub-Area.

Applicants should have had a sound general education, and possess an engineering degree or equivalent. They should have served an apprenticeship with a large engineering manufacturer or supply undertaking, and have had experience in general electrical testing and in the testing of protection apparatus.

The post is graded under Schedule A of the National Joint Board agreement as Class "L," Grade 13, £625 16s. per annum rising to £656 5s. per annum, inclusive of London Allowance.

Application forms, obtainable from Establishments Officer, 46 New Broad Street, E.C.2, to be returned duly completed by December 22, 1951. Please enclose addressed foolscap envelope and quote Ref. V/1375/T on all correspondence. (P 310)

LONDON ELECTRICITY BOARD

JUNIOR ENGINEER

APPLICATIONS are invited for the above position in the South Western Sub-Area Meter and Testing Branch, Testing Section, at Wimbledon, S.W.19.

Applicants should have some experience in the electricity supply industry, with a knowledge of the maintenance, repair and testing of electrical protective equipment. Qualifications up to Higher National Certificate standard are desirable.

The grading of the post, in accordance with Clause 35 of the National Joint Board Agreement, ranges from Class "J," Grade 18, £400 per annum, to Class "J," Grade 14, at £530 5s. per annum, inclusive of London Allowance and the commencing salary will be fixed according to experience.

Application forms, obtainable from Establishments Officer, 46 New Broad Street, E.C.2, to be returned duly completed by December 24, 1951. Please enclose addressed foolscap envelope and quote Ref. V/1336/T on all correspondence. (P 351)

BIRMINGHAM CITY TRANSPORT

APPOINTMENT OF ASSISTANT ELECTRICAL ENGINEER

APPLICATIONS are invited for the position of Assistant Electrical Engineer in the Corporation's Transport Department.

Applicants should hold the Higher National Certificate in Electrical Engineering or other suitable technical qualifications. The age of applicant must not exceed 35 years.

The duties will consist of assisting in development work on the electrical equipment of buses; preparation of electrical installation plans and estimates; supervision of electrical plant maintenance, the overhead traction system and V.H.F. radio.

The salary will be in the A.P.T. Division, Grade 4 of the National Scale of Salaries (£530-£575 per annum).

The successful applicant will be required to pass satisfactorily a medical examination.

The appointment is subject to the rules and conditions laid down from time to time by the Birmingham City Council and to the provisions of the Local Government Superannuation Act, 1937, and is determinable by one month's notice in writing on either side.

A form of application may be had on written application to the undersigned.

Applications must be delivered to the General Manager, Birmingham City Transport, Council House, Congreve Street, Birmingham 3, not later than December 22, 1951, the envelope to be endorsed "Assistant Electrical Engineer."

Canvassing, directly or indirectly, will be a disqualification.

W. H. SMITH,
General Manager.

Birmingham City Transport,
Council House, Congreve Street,
Birmingham 3. (P 364)

BRITISH ELECTRICITY AUTHORITY

Midlands Division

APPLICATIONS are invited for the positions of STATION ASSISTANT SHIFT CONTROL ENGINEERS at Stourport "A" and "B" Generating Stations. Salaries will be in accordance with Schedule A, Class "J," Grade 12 of the National Joint Board Agreement, commencing at £576 per annum.

Applicants should preferably possess the Higher National Certificate (electrical), and should have had a sound technical training and practical experience in the control and operation of steam generating plant and main switchgear.

Conditions of service will be in accordance with the N.J.B. Agreement, and superannuation under terms approved by the British Electricity Authority.

Applications should be made on forms which may be obtained from the Establishments Officer, 53 Wake Green Road, Moseley, Birmingham 13, and should be returned not later than December 22, 1951.

F. W. LAWTON,
Divisional Controller.
(P 339)

BRITISH ELECTRICITY AUTHORITY

London Division

STATION CHEMIST—BRUNSWICK WHARF GENERATING STATION

APPLICANTS should preferably be qualified Chemists and fully conversant with the day-to-day scientific problems to be expected in a modern generating station.

Salary will be in accordance with the N.J.B. Schedule, Class "G," Grade 7, i.e. £739 4s. per annum inclusive of London Allowance.

This post is superannuable

Applications, stating age, qualifications and experience, should be addressed to the Divisional Secretary, British Electricity Authority, London Division, Ergon House, Horseferry Road, S.W.1, and be received within fourteen days of the appearance of this advertisement.

J. N. WAITE,
Divisional Controller.
(P 346)

LONDON ELECTRICITY BOARD

ENGINEER (OPERATION AND MAINTENANCE)

APPLICATIONS are invited for the above position in the Willesden District of the North Western Sub-Area.

Applicants should be corporate members of the I.E.E. or hold equivalent qualifications and should have had extensive experience in system operation, load control, installation maintenance and fault location of 3-phase a.c. systems up to 11 kV and 3-wire d.c. systems, and the control of manual employees.

The post is graded under Schedule A of the National Joint Board agreement as Class "F," Grade 7, £710 17s. per annum rising to £730 16s. per annum, inclusive of London Allowance.

Application forms, obtainable from Establishments Officer, 46 New Broad Street E.C.2, to be returned duly completed by December 17, 1951. Please enclose addressed foolscap envelope and quote Ref. V/1354/T on all correspondence. (P 308)

ONTARIO, CANADA

A LARGE organisation urgently requires 10 SWITCHGEAR DRAUGHTSMEN, 10 MOTOR GENERATOR DRAUGHTSMEN, 4 INDUSTRIAL CONTROL DRAUGHTSMEN and 1 INDUSTRIAL MOTOR DRAUGHTSMAN. Applicants must be prepared to emigrate to Ontario, have served full apprenticeship with minimum three years experience. Age limit 45. Cost of transportation advanced if necessary.—Write for application forms:

Department "C,"
ONTARIO IMMIGRATION DEPARTMENT
12 New Burlington Street, London W.1. (P 369)

A LARGE iron works in the Midlands has a vacancy for an ASSISTANT WORKS ELECTRICAL ENGINEER. Applicants, who should have a degree in electrical engineering and be corporate members of the Institution of Electrical Engineers, should be not less than 30 years of age and have experience in generation, all kinds of control gear, both a.c., e.h.t. and d.c., converting plant involving large direct currents, works distribution (underground and overhead), all kinds and sizes of electric motors a.c. and d.c. from fractional to 4,000 h.p., etc. Applicants, who should have served a recognised apprenticeship, preferably in a large manufacturing works, must, in addition to having the necessary technical qualifications, be able to control labour and organise work to the best advantage. —Reply, stating age, whether married or single, qualifications, experience, etc., in strict confidence to Box No. 1263, Electrical Times. (P 318)

A SKILLED ARMATURE WINDER to take charge of repair shop winding department. Good opportunity for keen man to join growing company.—The Lewis Electric Company, Moor Works, Blackamoor Lane, Maidenhead. Tel. 2388. (P 256)

A VACANCY exists for a SENIOR METHODS ENGINEER at the Stafford Works of the English Electric Co. Ltd., in connection with the production of a wide range of high grade electronic gear including R.F. heaters up to 150 kW. Production development, production methods, shop layout, test, inspection and servicing facilities all come within the scope of this responsibility. Applications are invited from engineers preferably aged 30-40, who : (a) Have served a recognised apprenticeship with an electrical engineering manufacturer; (b) have the Higher National Certificate or equivalent qualification; (c) have had manufacturing experience involving technical responsibility for the production of electronic equipment. The appointed candidate will enter an expanding field with excellent opportunities for advancement. The company will offer help as far as possible in providing housing accommodation.—Write, stating age, qualifications, experience and salary required, quoting Ref. 945, to Central Personnel Services, English Electric Co. Ltd., 24-30 Gillingham Street, London S.W.1. (P 203)

AN OPPORTUNITY occurs with a well-known company for suitable WOMEN to be trained as WASHING-MACHINE ADVISERS. Knowledge of household electrical appliances and domestic science preferred. Must be mobile. Vacancies in London and the Provinces.—Apply to Box No. 1267, Electrical Times. (P 323)

APPLICATIONS are invited from mechanical engineers for the post of CHIEF METHODS ENGINEER in a division of the Stafford Works of the English Electric Co. Ltd., manufacturing a high grade medium engineering product to batch and customers' orders. Product development, production methods and processes, works layout and direction of technical staff all come within the scope of this responsibility. Applicants who should preferably be aged between 30 and 40 should : (a) have served a recognised engineering apprenticeship; (b) have the Higher National Certificate or equivalent qualifications; (c) have had manufacturing experience involving technical responsibility of the class of production defined above. This appointment is of senior status and the company will offer help as far as possible to the successful candidate in finding accommodation, if he is unable to purchase or rent a house privately.—Apply, stating age, qualifications, experience and salary required, quoting Ref. 903A, to Central Personnel Services, English Electric Co. Ltd., 24/30 Gillingham Street, London S.W.1. (P 189)

ASSISTANT REQUIRED by consulting engineer. Must be experienced in use of insulation and continuity testing sets, also conversant with modern a.c. and d.c. power and light circuits.—Apply Box No. 1275, Electrical Times. (P 340)

ASSISTANT SUPERINTENDENT required by old-established firm of electric cable makers for tec' nical duties in a North of England factory.—Apply, stating age, qualifications, experience and salary required to Box No. 1283, Electrical Times. (P 366)

COMPANY manufacturing diesel electric locomotives invites applications for the following staff:—DESIGNER DRAUGHTSMEN AND DRAUGHTSMEN who are experienced in the electrical and mechanical design of d.c. control equipment. Good salaries paid to men with exceptional qualifications. Three years agreement and every facility to find suitable living accommodation will be given. Staff Assurance scheme and good working conditions. Applications from men with industrial control gear experience will also be considered. Offers only to first-class men.—Please apply, giving full details of training, experience, age, etc., to Box No. 1253, Electrical Times. (P 278)

CONTRACT AND TENDERING ENGINEERS, with experience of l.t. and h.t. switchgear up to 11 kV required for switchgear department. Knowledge of 33 kV gear an advantage. Non-contributory pension scheme. Five-day week. Age 21 to 30. Possible housing assistance.—Please apply, giving details of training, experience, age, etc., to Central Labour Dept., The Brush Electrical Engineering Co. Ltd., Loughborough, Leics. (P 194)

CONTRACTS ENGINEERS required by prominent switchgear manufacturers. Appointments are in connection with export and home sales, and offer opportunities for eventual overseas or outside representation. Candidates should have gained at least Ordinary National Certificate or an engineering degree, and have had suitable works training.—Applications, giving full details of age, qualifications and experience, should be addressed to the Personnel Manager, A. Reyrolle and Co. Ltd., Hebburn, County Durham. (P 354)

BOX No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London W.C.2

DRAUGHTSMEN, ELECTRICAL, required for diagrams, cabling and electrical plant layout, etc. Excellent opportunity for experience in modern power station o.h. transmission and sub-station practice up to 275 kV. Good salaries for suitable men. Pension fund.—Write, giving age, details of training, experience and salary required to Box No. 735, c/o Walter Judd Ltd., 47 Gresham Street, London E.C.2. (P 204)

DRAUGHTSMEN (one senior, one junior), ELECTRICAL. Age range, 24-48. Experienced l.t. control gear, plant layout, and diagrams. Must have sound recognised apprenticeship and possess Higher National Certificate or equal. Site within easy reach of Wolverhampton. Good pension scheme (compulsory), canteen facilities, five-day week. State age, present salary, give references and detail apprenticeship training.—Box No. 1259, Electrical Times. (P 299)

DRAWING OFFICE STAFF REQUIRED. Transformer draughtsman for units up to 500 kVA, 11 kV. Sheet metal draughtsman for electrical and instrument cubicles and panels. Small electro-mechanism draughtsman.—Write, stating age, salary required, and previous experience, to Thermocontrol Installations Co. Ltd., 2-10 Valentine Place, Blackfriars Road, S.E.1. (P 322)

ELECTRICAL ENGINEER (age 18-25) required to assist with maintenance and operation of 2 MeV electrostatic generator. Test experience useful.—Apply to the Director, Radiotherapeutic Research Unit, Hammersmith Hospital, Ducane Road, W.12. (P 319)

ELECTRICAL ENGINEER required for S.W. England, age 30/35. Should be a corporate member of the I.E.E., have served engineering apprenticeship and have had several years responsible experience in design, specification, construction, installation and maintenance of all types of industrial electrical equipment. Starting salary £750 to £850 per annum, according to age and experience.—Full details of education, training and experience to Box No. T.6536, Haddons, Salisbury Square, Fleet Street, London, E.C.4. (P 159)

ELECTRICAL ENGINEER/SALESMAN required by merchant company in the Far East. Should hold Higher National Certificate or equivalent. Experience in X-ray or radio equipment an advantage. Bachelor not over 30. Commencing salary and cost-of-living approximately £780/£1,100 (according to age and experience); passage and furnished accommodation.—Staff Secretary, The Borneo Company Ltd., 143-149 Fenchurch Street, E.C.3. (P 321)

ELECTRICAL MANUFACTURERS require REPRESENTATIVE for London area with prospect of service later in the Middle East. Age 30/35. Excellent opportunity.—Apply, giving full particulars experience, etc., to Box 1279, Electrical Times. (P 360)

ELECTRICIAN MATES required, conversant with usual duties. Copies of references must be enclosed with application.—Box No. 1271, Electrical Times. (P 327)

ELECTRICIANS required, fully experienced with site maintenance, including lighting, heating, power, a.c. and d.c. supplies. Copies of reference must be enclosed with application.—Box No. 1269, Electrical Times. (P 326)

FIRST-CLASS EXPERIENCED DRAUGHTSMAN required West London for interesting work on small mass produced electro-mechanical devices. Good salary above A.E.S.D. rates paid to suitable man.—Details of experience and salary required to Box No. 1225, Electrical Times. (P 200)

FOREMAN ELECTRICIAN required by electrical manufacturers employing about 500. Work covers general factory maintenance of a.c. and d.c. plant.—Write Box No. K4887, A.K. Advg., 212a Shaftesbury Avenue, W.C.2. (P 370)

ILLUMINATING ENGINEER required by Metropolitan-Vickers Electrical Co. Ltd., London area. Preference given young man with National Certificate in Electrical Engineering.—Apply, giving particulars, Lighting Section, 1-3 St. Paul's Churchyard, London E.C.4. (P 355)

IMMEDIATE VACANCY—ELECTRICAL CHARGEHAND. E.T.U. power maintenance work on aqueduct contract, Rawtenstall, Lancs.—Write A. E. King, Commercial Hotel, Haslingden, Lancs. (P 357)

KUWAIT OIL CO. require an ASSISTANT ELECTRICAL ENGINEER (DESIGN) for service in Kuwait. Must possess full electrical apprenticeship and higher National Certificate. Graduate members of I.E.E. will be given preference. Must have experience in mains design and planning up to 11,000 V. Planning of industrial layouts an advantage. Age 30-35. Salary starting £830 p.a. clear, plus generous allowances, pension scheme and kit allowance.—Write, giving personal details and quoting K.1391, to Box D/80, at 191 Gresham House, E.C.2. (P 315)

METER READER AND CLERK required, conversant with usual duties. Copies of references must be enclosed with application.—Box No. 1273, Electrical Times. (P 328)

KUWAIT OIL CO. invites applications for the post of ASSISTANT ELECTRICAL ENGINEER (INSTALLATION) in Kuwait. Required for installation of high-voltage switchgear and plant up to 11,000 V and motors up to 500 h.p.; also the checking of complex protective relays. Mechanical experience an advantage. Must possess Higher National Certificate, but preference given to corporate members of I.E.E. Age 30 to 35. Salary starting £830 per annum, plus generous allowances, kit allowance and pension scheme.—Write, giving personal details and quoting K.1386, to Box D/31, at 191 Gresham House, E.C.2. (P 314)

MINISTRY OF FUEL AND POWER. ENGINEERING INSPECTOR, Electricity Division. The Civil Service Commissioners invite applications from men for a permanent and pensionable appointment.

Candidates must be at least 30 years of age on August 1, 1951. They must be Corporate Members of the Institution of Mechanical or Electrical Engineers and must have served an apprenticeship and have had good all round engineering training together with some practical experience on the power station side of an electrical undertaking. They should also have a working knowledge of the electricity supply industry in general.

The London salary scale is £900 to £1,200.

Further particulars and application forms from Civil Service Commission, Scientific Branch, Trinidad House, Old Burlington Street, London W.1, quoting No. S 4105/52. Completed application forms must be returned by January 3, 1952. (P 359)

ONE OR TWO FIRST-CLASS SALESMEN wanted by large and well-known electrical company to sell lamps and lighting fittings. Men of character and personality sought. Previous knowledge of this business an advantage, but not essential. Fine opportunity for future advancement. Salary and expenses, and car provided if outside London.—Apply in first instance to Box No. 1265, Electrical Times. (P 320)

REPRESENTATIVES. Rolls Switches, Ltd., are now appointing representatives in several areas to carry their world-famous domestic switches as an additional line to existing allied products, with a view to full-time representation when the full range of electrical accessories is in production.—Fully experienced men with established live connections, knowing their territory thoroughly, having proved sales record, are invited to write fully stating territory and other relevant information, which will be treated in the strictest confidence, to The Managing Director, 154/6, Blackfriars Road, London S.E.1. (P 271)

REQUIRED, ASSISTANT WORKS MANAGER. Manufacturing company employing 70 people, S.E. London. Must be conversant with transformer and electrical assemblies. Good disciplinarian over male and female labour. Excellent prospects for right man.—Write, giving previous experience and salary required, to Box No. 1237, Electrical Times. (P 219)

SALES ENGINEER required by leading industrial and commercial lighting fittings manufacturers to operate in territory covered by Merseyside and North Wales Electricity Board. Residence in or near Liverpool essential.—Reply in confidence, giving details of technical training, sales experience, past and present employment, etc., to Box No. 1247, Electrical Times. (P 261)

SALES MANAGER required by large, long-established engineering company. Must have first-class technical knowledge, preferably with university degree in electrical engineering. Extensive experience of electronics essential. Position offers wide scope for really live man possessing initiative and sales ability of high order.—Write, giving full details of age, education and positions held, to Box E.T. 609, at 191 Gresham House, E.C.2. (P 316)

SENIOR AND JUNIOR ELECTRICAL DESIGNERS, experienced in all classes of a.c. and d.c. dynamo electric machines from 5 to 5,000 h.p./kW. Five-day week. Superannuation scheme in operation.—Applications, stating age, experience and salary expected to Personnel Manager, Lancashire Dynamo and Crypto (Mfg.) Ltd., Trafford Park, Manchester 17. (P 325)

SKILLED OVERHEAD LINESMEN required for work in Southern and mid-East England. Experience of 11 kV lines essential. Top rates and allowances paid to suitable applicants.—Apply by letter to The Area Engineer, Enfield Cables Ltd., Lockfield Avenue, Brimsdown, Middlesex. (P 365)

TECHNICAL (ELECTRICAL) SALES ASSISTANT required by Pilkington Brothers Ltd., Glass Manufacturers, St. Helens, for their Power Line Insulator Department. Previous sales experience in the electrical industry and ability to handle correspondence essential. Qualifications: preferably H.N.C., but would consider O.N.C. Job will be internal to commence with, but may offer prospects for travelling later.—Applications should be addressed to the Chief Personnel Officer, Pilkington Brothers Ltd., St. Helens, Lancashire. (P 317)

SWITCHGEAR DRAUGHTSMEN required for layout and contract work. Opportunities for advancement to engineering grades.—Give full particulars of experience, salary, etc., to Ferguson Pailin Ltd., Higher Openshaw, Manchester 11. (P 356)

TECHNICAL ASSISTANT (ELECTRICAL) required for Central London office for the design and layout of factory electrification schemes, including substations, h.t. ring mains, transformers, m.t. switchboards, cabling distribution boards, motors, starters and lighting.

Applicants must be between 25 and 30 years of age and must hold the H.N. Certificate in Electrical Engineering. Preference to man holding the Graduate Examination of the I.E.E. Five-day week. Superannuation scheme. Salary according to experience. Successful applicant would have to be passed by the company's medical officer.

All applications (which should contain copies of two or more testimonials) will be treated in the strictest confidence, and should be addressed to Personnel Division (KAB-26), Lever Brothers and Unilever Ltd., Unilever House, Blackfriars, London E.C.4. (P 353)

THE BRUSH ELECTRICAL ENGINEERING CO., LTD., Loughborough, Leics, invite applications from experienced DRAUGHTSMEN. Excellent working conditions, canteen facilities, etc.—Applicants should write, giving full details of training and experience, to the Central Labour Dept. (P 215)

THE BRUSH ELECTRICAL ENGINEERING CO., LTD., Loughborough, Leics, invite applications from INSTRUMENT TRANSFORMER DRAUGHTSMEN with experience on current and potential transformers for systems up to at least 33 kV.—Applicants should write, giving full details of training and experience, to the Central Labour Dept. (P 216)

THE BRUSH ELECTRICAL ENGINEERING CO. LTD., Loughborough, Leics., have vacancies in their transformer department for DRAUGHTSMEN with good basic training in general engineering. Previous transformer experience not essential. Excellent opportunities for advancement under good working conditions for the right type of men.—Applicants should write, giving full details of training, experience, etc., to the Central Labour Dept. (P 253)

THE COMMONWEALTH RELATIONS OFFICE invite applications for a post of HYDRO-ELECTRIC ENGINEERING CONSULTANT for the Thal Development Authority, Punjab Province, Pakistan, under the Commonwealth Technical Co-operation Scheme for South and South-East Asia. Applicants must be qualified electrical engineers with special knowledge of hydro-electrical engineering, planning and design, and able to advise upon prospects of developing hydro-electric power from canals with low head falls. Age preferably between 35 and 45. Appointment is for three years at salary between £2,000 and £3,000 per annum according to qualifications and experience, with free accommodation, medical attention and travel facilities.

Application forms and further information obtainable from the Ministry of Labour and National Service, Technical and Scientific Register (K), Almack House, 26-28 King Street, London S.W.1, quoting D477/51-O-A. Closing date, December 22, 1951. (P 358)

THE STEEL COMPANY OF WALES LTD. invites applications for ASSISTANT DISTRIBUTION ENGINEER for large integrated iron and steel works; must have operating experience and be thoroughly conversant with modern protective gear and control circuits; good technical training essential; previous industrial and/or manufacturing experience would be an advantage. DISTRIBUTION FOREMAN for Abbey Works; must be able to accept responsibility and have had practical experience in the operation and maintenance of e.h.t. equipment on large interconnected systems; ability to carry out routine testing and instruct skilled staff; Technical knowledge desirable; previous industrial experience would be an advantage.—Applications to be submitted to the Personnel Superintendent, The Steel Company of Wales Ltd., Box No. 3, Port Talbot. (P 324)

TRANSFORMER FOREMAN for winding and another for assembly, all types up to 50 kVA. Really excellent opportunity for men with good practical experience requiring advancement. State age, experience, etc.—Box No. 1261, Electrical Times (P 313)

APPOINTMENTS WANTED

ELECTRICIAN - REPRESENTATIVE, 25, requiring change, seeks progressive appointment with well-known firm. Experience of contracting, motors, factory maintenance and sales of appliances.—Box No. 1281, Electrical Times. (P 361)

PERMANENT progressive position required by ELECTRICIAN-WIREMAN (27). Southern England preferred. All letters answered.—Box No. 1255, Electrical Times. (P 291)

WORK WANTED

A.C. and d.c. Motor Rewinds and Repairs. Prompt service, fully guaranteed. Edgware 8631 (4 lines). —Service Electric Co., Ltd., Stanmore, Middx. (D 324)

CAPACITY available for repetition SHEET METAL work up to 18g. Also GAS ARC and SPOT WELDING, and PRESSWORK up to 40 tons.—Redmond Engineering Co. Ltd., 270 High Road, Wood Green, London N.22. (P 277)

CASTINGS. Fisher Foundries, Ltd., Greet, Birmingham, have capacity for brass, gun metal and soft grey iron machine moulded repetition castings weighing 1-30 lb. Loose pattern work up to 3 cwt. Delivery by road to all parts. Tel.: B'ham, Victoria 0197. (L 318)

REWINDS, REPAIRS and CONVERSIONS, large and small. Industrial installations, plant maintenance. Prompt efficient service, moderate charges.—Magstarlite Ltd., Beavor Works, Beavor Lane, Hammersmith, London W.6. Tel.: Riverside 4291. (P 128)

WANTED

A.C./D.C. MOTORS, STARTERS, complete change-over installations, etc.—A.A. Electrical Co., Ltd., 67 Rothschild Road, Chiswick Park, W.4. Tel.: Chiswick 5105. (A 20)

BEST prices and a square deal offered in cash for ALUMINIUM, BRASS AND COPPER in sheets or rods. Works clearances and scrap a speciality.—Dyas and Fowle, 41 Loudoun Road, London N.W.8. Maida Vale 5477, 8641 and 5489. (N 61)

METAL AND WOODEN AMMUNITION BOXES, Folding Spades, Spade Covers, Picks, Axes wanted.—H. Pordes, 19 Nettledon Avenue, Wembley, Middx (WEM. 0632). (P 364)

ONE 1¼ h.p. MOTOR, 240 V d.c., totally enclosed, compound, geared to final speed of 25 r.p.m. One 1½ h.p. MOTOR, 240 V d.c., totally enclosed, compound, 3,000 r.p.m. One 14 h.p. MOTOR, 480 V d.c., totally enclosed or pipe vent., 2,000 or 3,000 r.p.m., complete with starter.—Full details to Mead Electric Co., Ltd., 113 Uxbridge Road, Ealing, W.5. Tel.: EAL. 3688. (P 329)

PAPER and cotton covered rectangular COPPER WINDING WIRES.—Please submit details in full to Box No. 1223, Electrical Times. (P 193)

PYROTENAX CABLES, etc., long or short lengths, particularly 1x.06 and 1x.15.—Fisher Electrical, 49 Graham Road and 199-205 Richmond Road, London, E.8. (P 240)

SCRAP ACCUMULATOR PLATES and Sediment wanted, any quantities. Also Storage Batteries purchased and dismantled.—Phone or write, Elton Levy Co. Ltd., St. Ermin's (West Side), Caxton Street, London S.W.1. Tel.: WHItehall 9621/2/3. (A 3)

STEEL Sheets, Plates, Strip and Bars. Any quantity, immediate payment. Grades Sheared Metal Co., Ltd., Green Lane, Hounslow, Middlesex. Tel.: Feltham 3274. (P 262)

TWO SYNCHROSCOPES, for use with 275 kVA alternators. 400/3/50 V supply.—Lewis Electric Motors, Moor Works, Maidenhead. Tel. 2388. (P 362)

WANTED, ROTARY CONVERTORS, any size.—Universal, 221 City Road, London, E.C.1. (A 16)

WANTED for prompt cash, ferrous and non-ferrous SCRAP; also plant for dismantling. Buyers of second-hand machinery and plant for re-use.—W. and H. Cooper, Ltd., 176 Brady Street, Bethnal Green, E.1. (A 1)

WANTED. Large quantity of 4-in. outside diameter TUBES from the dismantling of old Babcock Water-tube Boilers. Best prices paid. Prepared to purchase Babcock and Wilcox Water-tube Boilers for dismantling. —Apply, giving full details to Midland Iron and Hardware Co., Cradley Heath. (A 5)

WANTED, D.C. and A.C. ball-bearing MOTORS, MOTOR GENERATOR SETS, DYNAMOS and ALTERNATORS.—Full details to Britannia Manufacturing Co., Ltd., 22-26 Britannia Walk, London N.1. (A 13)

WANTED, small tools, oddments: nuts, bolts; surplus stores; broken packets; obsolete ship fittings; gadgets; electric items; non-ferrous nails, screws, pins, etc. £2 to £2,000 cash.—Leader, Gosford Street, Middlesbrough, also Paris, Amsterdam. (P 275)

BUSINESS OPPORTUNITIES

STATOR WINDING. Firm in N. London require large number F.H.P. STATORS to be wound. Cores and coils supplied.—Box No. 1257, Electrical Times. (P 292)

FOR SALE

CABLES & WIRE

AVAILABLE for immediate delivery at current market prices, quantities of bare and covered COPPER, NICKEL, CHROME and EUREKA WIRES, also P.V.C., V.I.R. and T.R.S. CABLES.—Apply: The Mulberry Company, 223 St. John Street, London E.C.1. Tel.: CLErkenwell 8356-7-8. (P 285)

TINNED STEEL ARMATURE BINDING WIRE. All sizes from 14 s.w.g. to 30 s.w.g. supplied in coil or on reels.—Frederick Smith and Co., Wire Manufacturers Ltd., Caledonia Works, Halifax. (N 20)

DOMESTIC APPLIANCES

IMMERSION HEATERS, Grubb 4 kW. No purchase tax. All lengths, 15 in. to 36 in. Standard voltages. Provision for intermediate loadings. Fully guaranteed. Write for illustrated brochure, latest lists and traders' terms to distributors.—John Owner and Co. Ltd., Springfield Road, Birmingham 13. Tel.: Spr. 2939. (C 392)

ENGINEERING PLANT & MATERIALS

ALUMINIUM and ALLOY SHEETS in various sizes available in most gauges. Copper, brass and aluminium in strip, rods and tubes.—Send for list or call Dyas and Fowle, 41 Loudoun Road, London N.W.8. Maida Vale 5477, 8641 and 5489. (N 62)

SMITH 2-ton overhead ELECTRIC GANTRY, span 31 ft 6 in., constructed 1941, electrical equipment, 400/440/3/50 c/s. Cage control.—John Cashmore Ltd., Engineers, Newport, Mon. Tel.: Newport 1944 (3 lines). (P 274)

GENERATING PLANT

STEAM DRIVEN GENERATING SETS. 1,000 kW geared Turbo Alternator Set by Fraser and Chalmers/G.E.C., comprising turbine running at 6,000 r.p.m., steam pressure 245 lb, total temperature 600 deg. F. exhausting to vacuum. 28 in., driving through reduction gear 6,000/1,500 r.p.m. Alternator 550/3/50 4-wire with direct coupled exciter. Complete with surface condenser and condenser auxiliary. Alternative output 700/900 kW with steam at 180/200 lb. pressure for 440/3/50.

665 kVA (500 kW) steam driven Alternator Set by Belliss and Morcom/Siemens, for 5,000/3/50, 77 amps. Steam pressure 150/155 lb. Speed 333 r.p.m.

375 kVA steam driven Alternator Set by Belliss and Morcom/L.D.M., for 470/3/25. Steam pressure 125 lb. exhausting to atmosphere. Speed 375 r.p.m. With modified valve setting 165 lb. w.p., 25 lb back pressure.

313 kVA (250 kW) steam Alternator Set by Browett Lindley/Brit. Westinghouse, for 500/3/50, 362 amps., 4-wire, 375 r.p.m. Steam pressure 140 lb sq in., back pressure 15 lb.—George Cohen, Sons and Co., Ltd., Wood Lane, London W.12. Tel.: Shepherds Bush 2070, and Stanningley, nr. Leeds. Tel.: Pudsey 2241. (P 302)

LIGHTING EQUIPMENT

BULBS, BULBS, BULBS, from 1·5 V to 250 V. Filament, Neon, Discharge. Specials, BRITISH AND AMERICAN. Prompt delivery.—Suplex Lamps, Ltd., 239 High Holborn, London W.C.1. (M 109)

PURLEY CHOKES AND BALLASTS. Our 80 W Tapped h.p.f. Ballast, with Starter Switch-holder incorporated, is proving itself the most popular unit. Suitable for most fittings, 57/6 each, subject.—F. W. Blanshard Ltd. (Dept. ET), Purley, Surrey. Uplands 4818/9. (E 343)

3 kW, 230 amps (direct-drive) ELECTRIC LIGHTING PLANT, complete with starting battery, all in excellent order, and suitable for any size house. Only reason for sale, owner on main. Price £125.—Edward Manby Wenham Place, Great Wenham, Tel. 296. (P 363)

METERS

A.C./D.C. QUARTERLY and SLOT METERS.—Brent Electrical Co., 6 Holmdale Gdns., N.W.4. (A 15)

HOUSE-SERVICE METERS, a.c. or d.c., quarterly or prepayment.—Universal Electrical, 221 City Road, London E.C.1. (C 51)

METERS, a.c. and d.c., new and reconditioned, all types. Quarterly, single- and three-phase, 3- and 4-wire, 2½ to 1,000 amp. Prepayment, single and double tariff; single, dual and triple coin; fixed and variable tariff, 2½ to 50 amp. M.D.I., billiards switches, rent collectors. Prices from 5/-, carriage paid. Guaranteed for ever. Immediate delivery.—Illustrated catalogue from The Electric Meter Co., Castor Road, Brixham. (P 334)

MOTORS & STARTERS

ELECTRIC MOTORS, GENERATORS, TRANSFORMERS A.C. & D.C.
STARTERS, SLIP RING & D.C., SEMI-AUTOMATIC
Any voltage, new, short delivery, all types of revolving electrical power.
ELECTROPOWER COMPANY LIMITED
Kingsbury Works, Kingsbury Road, London N.W.9.
Telephone: COLindale 4621/2. (D 17p)

A. A. ELECTRICAL CO. FOR A.C./D.C. MOTORS, SWITCHGEAR, EXHAUST FANS, HOISTS, REDUCTION GEARS, new or reconditioned units.—Chiswick 5105, Fairlands 8279, 67 Rothschild Road, W.4. (A 19)

A. C. and D.C. MOTORS, GENERATORS from stock.—Service Electric Co., Ltd., Honeypot Lane, Stanmore, Middx. Edgware 8631/4. (A 476)

A. C. and D.C. MOTORS, GENERATORS, SWITCHGEAR, etc., always in stock. Let me have your inquiries.—G. E. Whittaker, Wellington Mill, Bolton Road, Blackburn. Tel. 7232. (A 12)

A. C. and D.C. MOTORS, all sizes, large stocks fully guaranteed.—Milo Engineering Works, Ltd., Milo Road, East Dulwich, S.E.22. (Forest Hill 2278-9). (A 10)

BROOKS MOTORS AND STARTERS, as new. E.R.9, 250 V, 3,000 r.p.m. Starter ZT.3. S.C.10, 440 V, 1,500 r.p.m. Starter T.15. Two Hunt condensers. Brand new. List No. Z9418. £45 or separate.—A. Maxwell, 16 Avenue Road, Gateshead. (P 331)

FOR ELECTRICAL MOTORS, GENERATORS, ALTERNATORS, SWITCHGEAR, please send your inquiries to Oldfield Engineering Co., Ltd., 96 East Ordsall Lane, Salford 5. (C 296)

ONE 12½ h.p. SLIP-RING MOTOR, Victoria Electric Plant Company, 200 V, 1-phase, 50 cycles, 725 r.p.m., complete with starting gear, d.p. oil circuit-breaker, etc. One 200/300 V d.c. diesel GENERATING SET, 36 kW, complete with switchboard. One 460 V d.c. diesel GENERATING SET, 65 amps., complete with switchboard, etc. Various D.C. MOTORS.—Fry and Co., Ltd., Portslade, Sussex. (P 332)

SPECIAL offer 25 new 1/6-h.p. cap. MOTORS, 230/1/50, 1,425 revs., B.T.H.—Sugdens, Glenny Rd., Barking. (P 188)

SWITCHGEAR

MERCURY SWITCHES are made by Hall Drysdale and Co., Ltd., of 58 Commerce Road, Wood Green, London N.22. Tel.: Bow 7221. (C 175)

TRANSFORMERS & CONVERTORS

MERCURY ARC RECTIFIER. Bruce Peebles. 230 kW; input 380/400/420 V; 3-phase 50-cycles; output 460 V d.c. Complete with spare bulb.—Brown Brothers and Co. Ltd., Rosebank Ironworks, Edinburgh 7. (P 333)

TRANSFORMERS, 10 kVA, 230/110, 110/230 V. Also 10, 20, 30 and 50 kVA, 3,300-400 V. Oil-filled indoor type.—H. B. Barnard and Sons Ltd., Dudley Port, Tipton, Staffs. (P 335)

UNCLASSIFIED

BATTERIES, lead-acid storage, 60 cells, 350 amp. hr. each, by P. and G. and E. P. S., Ltd.; unused, in maker's cases.—B. Dixon-Bate, Ltd., Chester. (P 264)

SWITCHGEAR. Two 300 amp. h.t. draw-out type Switch Cubicles by Ferguson Pailin; 11 kV, rupturing capacity 50 MVA, complete with all instruments, etc. BATTERIES 150 amp. hour Alkium Alkaline Battery by Britannia Batteries, type K.15H, having 24 units each of 8 cells, carried on timber battery stand, complete with 2 Westinghouse Metal rectifiers and Westinghouse charging and control board.—B.C.S. (Engineers and Contractors) Ltd., 3 Castle Street, Cardiff. Tel.: Cardiff 8512-3-4. (P 367)

50 H.P. L.D.C. 480 r.p.m., 440/3/50 S.C. motor, ballbearing machine, in excellent condition, with pedestal star delta starter and ammeter: £165 f.o.r.—P. B. Crawshay, 166 Pixmore Way, Letchworth, Herts. Tel. 1147. (P 330)

MISCELLANEOUS

CITY AND GUILDS (Electrical, etc.) on "No pass—No Fee" terms. Over 95% successes. For full details of modern courses in all branches of Electrical Technology send for our 144-page handbook, FREE and post free. B.I.E.T. (Dept. 39), 17 Stratford Place, London W.1. (D 244)

RICHARDS AND PARTNERS, associated with George Offord and Co., Auctioneers and Valuers of PLANT AND MACHINERY AND INDUSTRIAL PROPERTY, Granville House, Arundel Street, London W.C.2. Tel.: TEMple Bar 7471. (A 23)

THE PROPRIETOR of British Patent No. 607,108 for "IMPROVEMENTS IN AND RELATING TO ELECTROMAGNETIC VIBRATORS," desires to enter into negotiations with a firm or firms for the sale of the patent or for the grant of licences thereunder.—Further particulars may be obtained from Marks and Clerk, 57 and 58 Lincoln's Inn Fields, London W.C.2. (P 308)

ONE PROBLEM SOLVED!
—what to give boys (of 13 up) for Christmas
DR. PERCY DUNSHEATH'S
new book is just right.
"THE ELECTRIC CURRENT"
A very fascinating account of modern electrical knowledge and achievement. Lavishly illustrated. 18/6 net from any bookshop.
Published by:
G. Bell, 6 Portugal Street, W.C.2
(P 245p)

NEWALL Adjustable GIRDER CLIPS (SHERARDISED FINISH)

fit all types and sizes of Girders

Standard Size for ¾ in., ½ in. or 1 in. diameter Tubes or Armoured cables of equal diameter.

Tubes or Cables can be run at **right angles or parallel to** Girders, by releasing countersunk locking screw, and turning Saddle Plate one-quarter turn.

Larger Sizes for 1¼ in., 1½ in. and 2 in. diameter Tubes or Armoured cables. Multiples to order.

EVANS & NEWALL LTD.
(T.I.M.)
Primrose Street, New Cross, Manchester, 4
Telephone: CENtral 1253-4 *Telegrams:* "Cymric"

Illustrated Catalogue and full particulars will be forwarded on request

INDEX TO ADVERTISERS

Abelson & Co., Ltd. 92
Aidas Electric Co., Ltd. 25
Arora Co. 76
Ash & Lacy, Ltd. 22
Ashley Accessories, Ltd. ... 21
Astor Boisselier & Lawrence, Ltd. 46
Automatic Light Controlling Co., Ltd. 90
Automatic Telephone & Electric Co., Ltd. 35

Best Products, Ltd. 12
B.I.P. Streetly Co., Ltd. 9
Bowker, S. O., Ltd. 11
British Electricity Authority ... 19
British Electric Transformer Co. Ltd. 2
British Insulated Callender's Cables, Ltd. 37
British Iron & Steel Federation ... 40
British National Electrics, Ltd. ... 44
British Rototherm Co., Ltd. ... 38
British Thomson-Houston Co., Ltd. 17, 32
Britmac Electrical Co., Ltd. ... 53
Brook Motors, Ltd. 6
Burco, Ltd. 92
B.V.C. Industrial Constructions, Ltd. 87

Cable Makers' Association ... 8
Carter & Co. (Nelson), Ltd. ... 30
Chilton Electric Products, Ltd. ... 34
City Engineering Co. (Boreham Wood), Ltd. 22
Clang, Ltd. 90
Cole, E. K., Ltd. 12
Copper Development Association 81
Coughtrie, J. & G., Ltd. 89
Cressall Manufacturing Co., Ltd. 4
Critchley Bros., Ltd. 30
Crompton Parkinson, Ltd. 2, 79

Dexion, Ltd. 38
Diamond "H" Switches, Ltd. ... 80
Dorman & Smith, Ltd. 84

East London Mica Works ... 78
Edison Swan Electric Co., Ltd. ... 91
Edwards, F. J., Ltd. 92
Eeto Insulations 92
Ekco-Ensign Electric, Ltd. ... 36
Enfield Cables, Ltd. 57
Engel & Gibbs, Ltd. 88
English Electric Co., Ltd. 39, 77
Evans & Newall, Ltd. 73

Falk Stadelmann & Co., Ltd. ... 5
Fenton, Byrn & Co., Ltd. ... 4
Ferguson Pailin, Ltd. 7
Ferranti, Ltd. 1
Fluxite, Ltd. 86

General Accessories Co., Ltd. ... 58
General Electric Co., Ltd. 55, 62, 85
Gledhill-Brook Time Recorders, Ltd. 12
Green, E., & Sons, Ltd. 14
Grimmer, W. H. 88

Hardy & Padmore, Ltd. ... 34
Henley's, W. T., Telegraph Works Co., Ltd. ... 42, 63
Higgs Motors, Ltd. 10
Hillman Electrical, Ltd. 88

Igranic Electric Co., Ltd. ... 15
Imperial Chemical Industries, Ltd. 18
Ismay Lamps, Ltd. 88

Johnson & Phillips, Ltd 13

Kautex, Ltd. 54
Kaye, E. & E., Ltd. 56
Kohler Co., Ltd. 84

Low, Duncan, Ltd. 22
Lyons, Claude, Ltd. 23

Mather & Platt, Ltd. 16
McGeoch, William, & Co., Ltd. 4
Measurement, Ltd. 20
Mek-Elek Engineering, Ltd. ... 86
Metafiltration Co., Ltd. 50
Metropolitan-Vickers Electrical Co., Ltd. 51
Metway Electrical Industries, Ltd. 46
Moss, William, & Sons 38

National Cash Register Co., Ltd. 16
Nife Batteries, Ltd. 3

Parmiter Hope & Sugden, Ltd. ... 95
Parsons, C. H. (Britmac), Ltd. ... 53
Pinchin Johnson & Associates, Ltd. 59
Pitman, Sir Isaac, & Sons, Ltd. ... 76
Powell Duffryn Carbon Products, Ltd. 48
Premier Electric Heaters, Ltd. ... 75

Radiovisor Parent, Ltd. 82
R.C. Radio-Electric, Ltd. ... 84
Record Electrical Co., Ltd. ... 52
Reels, Ltd. 56
Reyrolle, A., & Co., Ltd. ... 49
Rowlands Electrical Accessories, Ltd. 93

Sanders, William, & Co. (Wednesbury), Ltd. 90
Sangamo Weston, Ltd. 64
Sax, Julius, & Co., Ltd 16
Senior Economisers, Ltd. ... 94
Serck Tubes, Ltd. 86
Sew-Tric, Ltd. 50
Shell-Mex & B.P., Ltd. 27
Shupak, W., & Co., Ltd. ... 86
Siemens Electric Lamps and Supplies, Ltd. 43
Simmonds & Stokes (Niphan), Ltd. 80
Simplex Electric Co., Ltd. ... 41
Simon-Carves, Ltd. 33
Smith Meters, Ltd. 96
Standard Telephones & Cables, Ltd. 26
Steatite Insulations, Ltd. ... 42
Steatite & Porcelain Products, Ltd. 58
Stewarts & Lloyds, Ltd. ... 28
Sutcliffe Speakman & Co. Ltd. ... 78

Thorn Electrical Industries, Ltd. 45
T.M.C. Harwell (Sales), Ltd. ... 24
Tudor Accumulator Co., Ltd. ... 29

Universal Boilers & Engineering Co., Ltd. 82

Venner Time Switches, Ltd. ... 60

Wandleside Cable Works, Ltd. 74
Ward, Thomas W., Ltd. 76
Westinghouse Brake & Signal Co., Ltd. 83
Wireohms, Ltd. 84
Wootton & Co., Ltd. 90

Yorkshire Electric Transformer Co., Ltd. 31
Yorkshire Switchgear & Engineering Co., Ltd. 47

First Class Quality Cables

WANDLESIDE CABLE WORKS LTD.

106 GARRATT LANE

WANDSWORTH, LONDON, S.W.18

V.I.R., T.R.S., LEAD-COVERED

WANDLE CABLE BRITISH MADE

WANDLE FLEX BRITISH MADE

Quality sells — Fine-Quality sells better

PREMIER Toasters are not gadgets—they will *not* play cheerful tunes at the touch of a button, neither will they fry eggs—but they will toast bread—perfectly and uncomplainingly for the best part of your customer's lifetime . . . long life lies in the Fine-Quality of the materials used in construction—order now for Xmas.

PREMIER

ELECTRIC APPLIANCES

PREMIER ELECTRIC HEATERS LTD., BIRMINGHAM 9

Member of the A.E.I. Group of Companies

6128E

RAILS for SALE

30 tons New Slightly Defective F.B. Rails, 80 lb. yard. Old B.S. lengths, chiefly 45 ft.

10 tons New Slightly Defective F.B. Rails, 77 lb. yard, lengths 41 ft.

100 tons New Perfect Bull Head Rails, 95 lb. yard. Revised B.S. lengths, chiefly 60 ft.

30 tons Good Secondhand Bull Head Rails, about 85 lb. yard, lengths, chiefly 60 ft.

500 tons New Stock Rusty F.B. Rails, 75 lb. yard. B.S. Revised lengths, chiefly 12 ft to 12 ft 10½in.

100 tons Good Second-hand Chairs, S.I. Pattern to suit 95 lb. B.H. Rails, with three holes for coach screws and ferrules. About 350 New Complete Turnouts, 24-in. gauge, made from 20 lb. F.B. Rails, mounted on Steel Sleepers about 15/16 ft. 6 in. overall.

50 Very Good Second-hand Double-Side Tip Wagons, 2 ft. gauge, 1 cu. yd. cap. 16 in. wheels 2¾ in. axles, in metal-lined plain bearings, strong construction.

90 Good Second-hand Double-side Tip Wagons, 2 ft. gauge, 1 cu. yd. cap., Hudson make with roller or ball bearings.

43 Ditto, Ditto, 2/3 cu. yd. capacity.

500 Steel Sleepers, 2 ft. gauge, to suit 20 lb. F.B. Rails, complete with Clips and Bolts.

15 tons Good Second-hand Soleplates to suit 75 lb. F.B. Rails.

350 Pairs New Fishplates, punched at 4 in. centres for 35 lb. F.F. Rails.

50 tons New Stock Rusty Fishplates, to suit 75 lb. F.B. Rails, B.S. Section, punched at 4 in. centres.

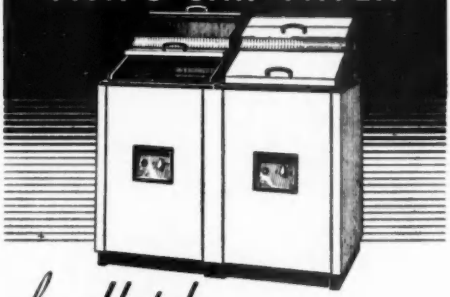
1,000 yards Good Second-hand Portable Railway 2 ft. gauge, made from 20 lb. F.B. Rails, mounted on Steel Sleepers complete with all fastenings.

340 yards Second-hand Portable Railway, 18 in. gauge, made from 25 lb. F.B. Rails, with steel sleepers and all fastenings.

160 yards Second-hand Portable Railway, 18 in. gauge, made from 14/16 lb. F.B. Rails.

THOS W. WARD LTD
ALBION WORKS · SHEFFIELD
'PHONE 26311 (22 LINES) 'GRAMS 'FORWARD'
LONDON OFFICE: BRETTENHAM HOUSE LANCASTER PLACE STRAND W.C.2

'ARORA' electric
FISH & CHIP FRYER



for Hotels, Restaurants & Canteens.

SEND FOR LEAFLET C494

The ARORA Company ROSEBERY STREET. LOUGHBOROUGH
Specialists for over 30 years

207

PITMAN

Electrical Engineering Theory and Practice. (3 vols.)
By Philip Kemp, M.Sc.Tech., M.I.E.E., assisted by over 40 contributors. Over 2,000 illustrations. Per set, £10 net.

Shadow and Diffusion in Illuminating Engineering
By Konrad Norden, Ph.D., F.I.E.S. A scientific study of the subject with special reference to industrial needs. Illustrated. 25s. net.

Transformers
By F. C. Connelly, Ph.D., A.M.I.E.E., A.R.C.S., D.I.C. A guide to the principles and design of transformers used in light electrical and radio equipment. 35s. net.

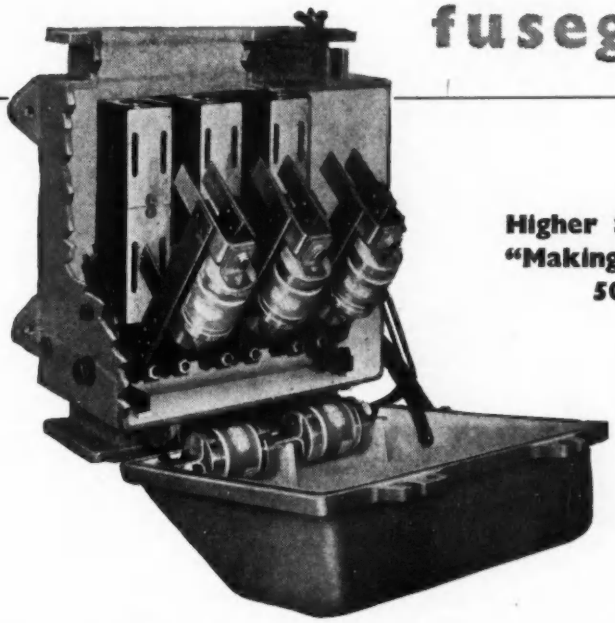
Industrial Administration and Management
By F. L. Meyenberg, M.I.Mech.E., M.I.E.E. A text book for students taking the various professional examinations featuring this subject. 35s. net.

Cathode Ray Oscillographs
By J. H. Reyner, B.Sc.(Hons.), A.C.G.I., D.I.C., etc. Fourth Edition. 138 illustrations. 15s. net.
"Anyone desiring an understanding of the cathode ray oscillograph cannot do better than purchase this book."—*Electrical Times.*

PITMAN, *Parker Street, Kingsway, London, W.C.2*

'ENGLISH ELECTRIC'

fusegear



Higher Short-circuit "Making" Capacity— 50 MVA

Previously tested at 25 MVA, 'ENGLISH ELECTRIC' combination fuse switches of the new standard shrouded pattern have now successfully passed 3-phase 440 volt short-circuit "making" tests at 35 MVA and 50 MVA.

The ratings tested were 30, 60, 150, 300, 500 and 750 amps.

Three successive "make" tests were made, after which the 30, 60 and 150 amp. combination fuse switch units were fit for commercial use without reconditioning. Only slight rectification of contacts on the larger sizes was necessary.

All 'ENGLISH ELECTRIC' combination fuse switches incorporate 'ENGLISH ELECTRIC' high rupturing capacity non-deteriorating type 'T' cartridge fuse links which are A.S.T.A. certified to B.S.88-1947 for Category of Duty 440AC5.

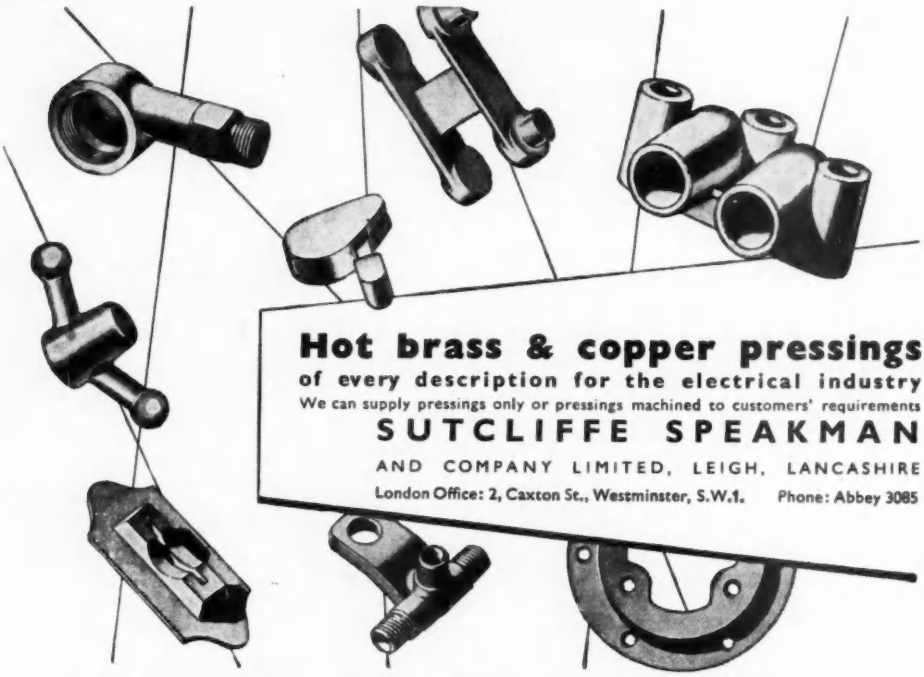
The ENGLISH ELECTRIC Company Limited

QUEENS HOUSE, KINGSWAY, LONDON, W.C.2

Fusegear Works: East Lancashire Road, Liverpool 10

Works: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL

F.5



Hot brass & copper pressings

of every description for the electrical industry

We can supply pressings only or pressings machined to customers' requirements

SUTCLIFFE SPEAKMAN

AND COMPANY LIMITED, LEIGH, LANCASHIRE

London Office: 2, Caxton St., Westminster, S.W.1. Phone: Abbey 3085

Electrical Insulation

MICA

Washers
Plates
Commutator Segments
Stampings
Stove Plates
Heater Strips,
etc.

MICANITE

Mouldings, Commutator Vee Rings, Tubes, Covered Bars, Commutator Segments, Heater Strips, Sheet Material in Moulding, Flexible, Heat Resisting and Commutator Qualities, etc.

BAKELITE

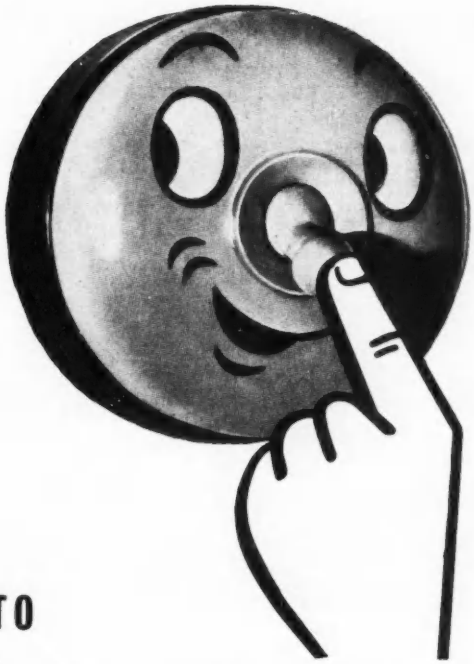
Tubes
Bushes
Bobbins
Washers
Stampings
Panels
Covered Bars,
etc.

Manufactured by

EAST LONDON MICA WORKS

RINGWOOD ROAD, WALTHAMSTOW, LONDON, E.17

'Phone: KEYstone 4254 *Telegrams: Elmicmer, Easphone, London*



SWITCH TO

Crompton LAMPS

and you're **on** to a good thing

CROMPTON PARKINSON LIMITED, CROMPTON HOUSE, ALDWYCH, LONDON, W.C.2

Telephone: CHAncery 3333 *Telegrams: Crompark, Estrand, London*

F

NIPHAN

WEATHERPROOF METAL-CLAD PLUGS, SOCKETS, SWITCH PLUGS, ETC. for all electrical purposes

5/300 amp. 250/500 volt.

Plug
Through Angle Socket with Cover and Plug
C.I. Terminal Socket & Cover with through sealing chamber and glands for cable
Plug
C.I. Switch Socket and Plug
Flange Socket and Cover

(Latest Catalogue on Application)

SIMMONDS & STOKES (NIPHAN) LTD

MANUFACTURING ELECTRICAL ENGINEERS

Victoria House, Southampton Row, London, W.C.1 · Holborn 8637 and 2163

OVERSEAS AGENTS: *S. AFRICA, Hubert Davies & Co., Ltd., Johannesburg. CEYLON, Walker & Greig, Ltd., Colombo. NEW ZEALAND, Samuel Brown, Ltd., Wellington. KENYA, R. W. Ketchley & Co., Nairobi, British East Africa.*

talking of toggle switches...

For A.C. or D.C., for simple or complicated circuits, you are best served by the manufacturers having a world-wide and long experience. A good reputation needs zealously guarding. Our many customers believe—

Snap action Toggle Switches used for "all and sundry" purposes does not imply that they can be adequately produced by similar means! Experienced and studied design provide quality.

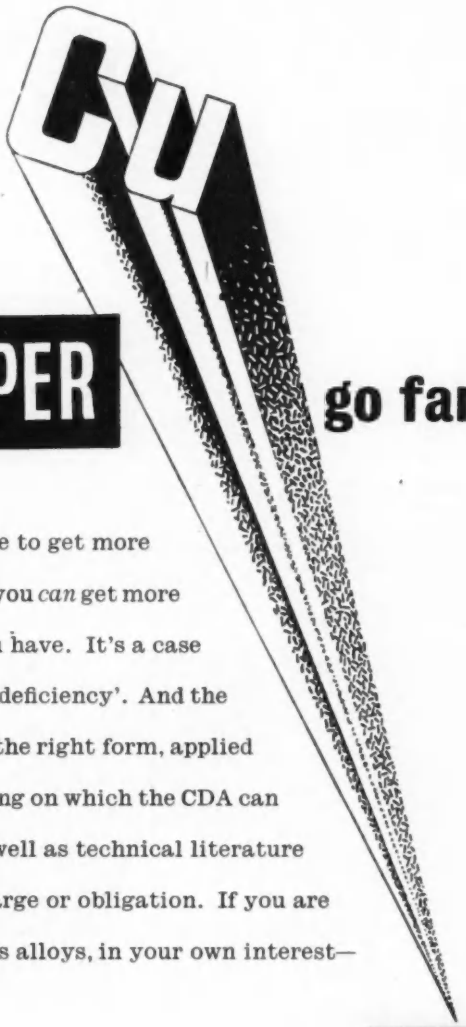
the right answer is a 'DIAMOND H' product

"DIAMOND H" SWITCHES LTD

GUNNERSBURY AVENUE, CHISWICK, LONDON, W.4

Telephone: CHISWICK 6444/6/7/8 *Cables and 'Grams:* "DIAMONHART, CHISK, LONDON."

LAS 21



Make COPPER go farther

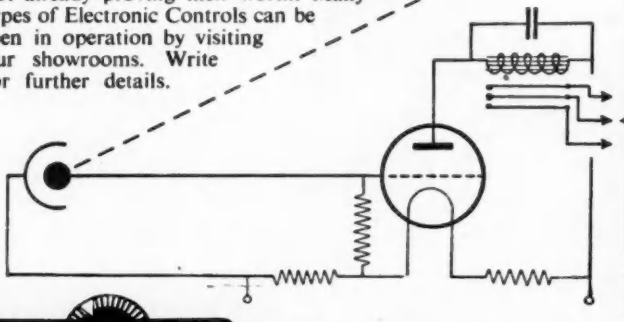
You may not be able to get more copper at the moment, but you *can* get more from the copper you have. It's a case of 'more efficiency, less deficiency'. And the right material, in the right form, applied in the right way is something on which the CDA can give expert advice—as well as technical literature—free of charge or obligation. If you are concerned with copper or its alloys, in your own interest—

Consult the CDA

COPPER DEVELOPMENT ASSOCIATION KENDALS HALL · RADLETT · HERTS

Photo-Electric Controls are SIMPLE and CERTAIN

The simplest way of solving any problem by Photo-Electric or Electronic Controls is to call on the experience and resources of Radiovisor Parent Ltd. There are few industries in which Radiovisor controls are not already proving their worth. Many types of Electronic Controls can be seen in operation by visiting our showrooms. Write for further details.

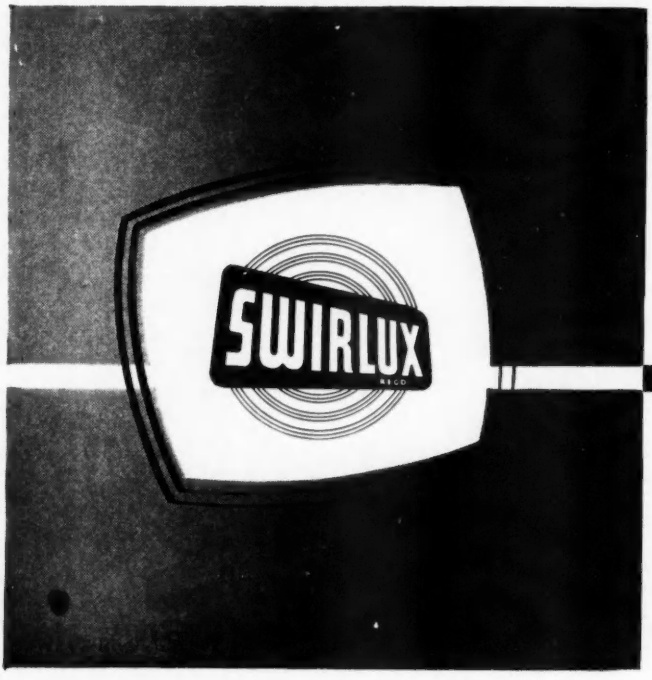


- *Flamestat Flame Failure Control*
- *Hopper and Bunker Level Control*
- *Protective Guard Ray*
- *Automatic Radiation Pyrometer*
- *Factory and Street Lighting Control*
- *Counting and Batching Unit*
- *Print Registration*
- *Smoke Detector Fire Alarm*
- *Invisible Ray Burglar Alarm*
- *Press Brake Guard Ray*
- *Industrial Smoke Density Indicator*

RADIOVISOR TRADE MARK

PHOTO-ELECTRIC AND ELECTRONIC CONTROLS

RADIOVISOR PARENT LTD · 1 STANHOPE ST · LONDON N.W.1 · TEL: EUSTON 5905/6



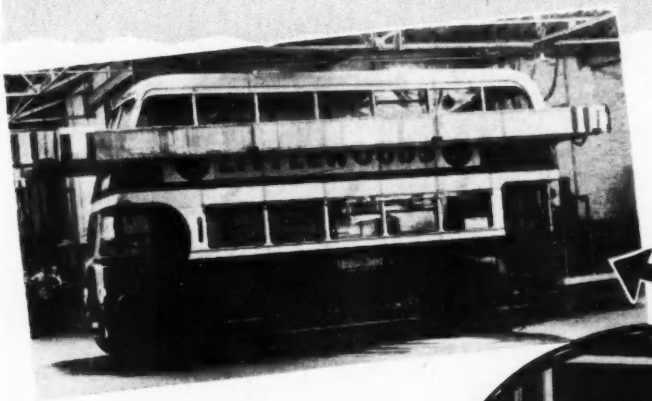
Swirlux washing machines have already proved themselves to be a popular favourite—but owing to the present situation, output is almost entirely taken up by export consignments.

Details of this latest Versco product are available from the sole manufacturers:

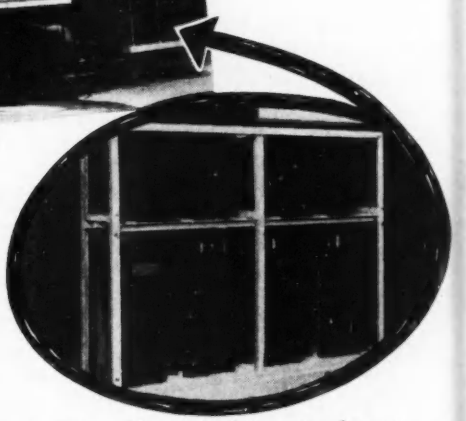
UNIVERSAL BOILERS & ENGINEERING CO. LTD.
Burnley, Lancs.

n.d.h.

Here is yet another
Single to Three-Phase conversion



Photographs by courtesy of the Maidstone & District Motor Services Ltd.



—at the Tunbridge Wells garage of the Maidstone & District Motor Services Ltd., where two three-phase "Essex" Bus Washing Machines are operating from a single-phase supply through Westinghouse Static Phase Converters. So varied are the applications for which these converters are now installed, and so wide is our experience on single- to three-phase conversion that we are confident we can deal with your own particular problem. And because they are completely static in operation, Westinghouse converters require no maintenance, and can therefore be installed in any odd corner. And in the case of machine shops where more motors may become necessary, more converters can readily be added to the existing bank to give the greater output required.

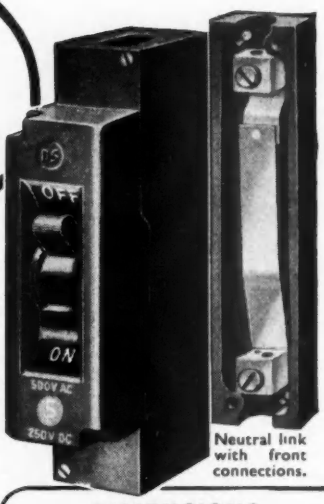
WESTINGHOUSE

STATIC PHASE CONVERTERS

Publication E.E.1 contains much useful information on the various applications of Westinghouse Static Phase Converters, and a copy can be obtained from

DEPT. E.T. 22
WESTINGHOUSE BRAKE & SIGNAL CO. LTD., 82, York Way, King's Cross, London, N.1

Introducing **DORMAN MINIATURE CIRCUIT BREAKERS**



Neutral link with front connections.

TESTED BY THE NATIONAL PHYSICAL LABORATORY

Designed to give unfailing protection to all types of electrical circuits and equipment up to a maximum current rating of 50 amps at 500 V a.c. or 250 V d.c. On ordinary overloads tripping may be instantaneous or have an inverse time delay characteristic, but in all cases instantaneous tripping occurs on a large overload or short circuit. The mechanism is normally sealed to prevent interference with settings. Neutral mechanism designed as a separate unit, to be fitted underneath the main unit when required. Certified rupturing capacities 10,000 amp at 250 V d.c., 10,000 amp at 440 V a.c. at pf. 0.62 lag. Complies with the requirements of Lloyd's Register of Shipping.

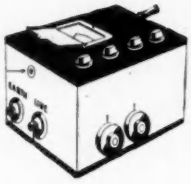
ORDSAL

DIMENSIONS
5" Length x 1⅛" Width x 3" MAXIMUM PROJECTION

Write for illustrated folder M.C.B.

DORMAN & SMITH LTD · MANCHESTER · 5

AT A FRACTION OF COST



LATEST TYPE
EVERSHED & VIGNOLES
BRIDGE MEGGER
Testing Sets
(Series 2)

in leather carrying cases. Resistance Bridge Range 200 Megohms to 50 Megohms.

£14/10/0 to £19/10/0
Packing & Carriage 5/- extra

These instruments (new price over £60) although secondhand, are in perfect working order and carry an efficiency label from A.I.D. examiners.

R. C. RADIO-ELECTRIC, Ltd.
4, Conduit Court, Long Acre, LONDON, W.C.2
Temple Bar 0233/4
Telegraphic Address: Loudsigs, Rand, London.

KOHLER ELECTRIC PLANTS

Fully automatic A.C.115 volts 750 watts now available for independent or emergency lighting, small tools, etc. Larger plants expected soon.

Full details from:—

KOHLER CO. LTD.
66 BOLSOVER ST., LONDON, W.1
Tel.: Euston 4701. Grams: ERKOHL, WESDO, LONDON

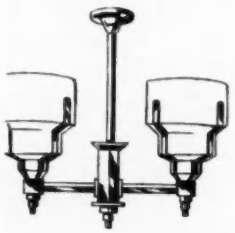
WIREOHMS, LTD.
NOTTINGHAM

Makers of
ALL TYPES OF
ELECTRIC ELEMENTS

SOLE WORLD DISTRIBUTORS:
H. J. BALDWIN & CO., LTD.
Baldwin House Nottingham

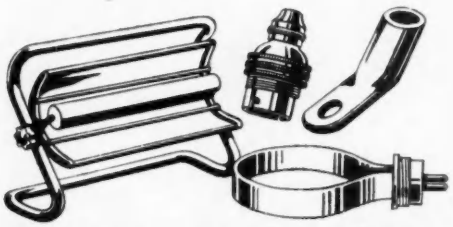
THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

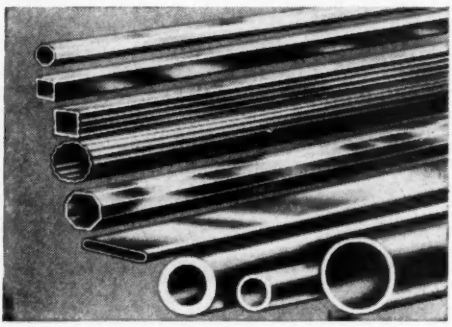
Serck TUBES get into hot water!

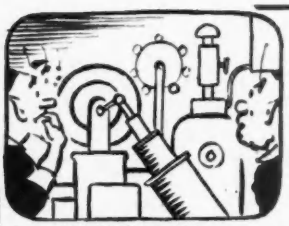


Serck Tubes are prominent throughout the electrical instrument component and accessory trade. Their versatility is in ever increasing demand.

SERCK TUBES LTD.,
WARWICK ROAD
BIRMINGHAM, 11







"THE FLUXITE QUINS" AT WORK

"Perpetual motion's no dream,
Here's my latest invention supreme.
Fixed with FLUXITE you see.
But I've forgotten,"
moaned EE,
"Whether it's driven by petrol —or steam!"

For all SOLDERING WORK—you need FLUXITE—the paste flux—with which even dirty metals are soldered and "tinned." For the jointing of lead—without solder; and the "running" of white metal bearings —without "tinning" the bearing. It is suitable for ALL METALS—excepting ALUMINIUM—and can be used with safety on ELECTRICAL and other sensitive apparatus.

With Fluxite, joints can be "wiped" successfully that are *impossible by any other method.*

Used for over 40 years in Government works and by leading Engineers and Manufacturers. OF ALL IRONMONGERS in tins—from 1/- upwards.

THE FLUXITE GUN puts FLUXITE where you want it by a simple pressure. Price 2/6 or filled 3/6

FLUXITE

SIMPLIFIES *ALL* SOLDERING

Write for leaflets on case hardening steel and tempering tools with FLUXITE, also on "wiped" joints. Price 1½d. each
FLUXITE LTD. (Dept. E.T.) Bermondsey St., S.E.

DRUM TILT & STAND

For 40—45 gal. Drums. For easy and safe draining. Price £5 : 5 : 0 each. Used by many firms of national repute.

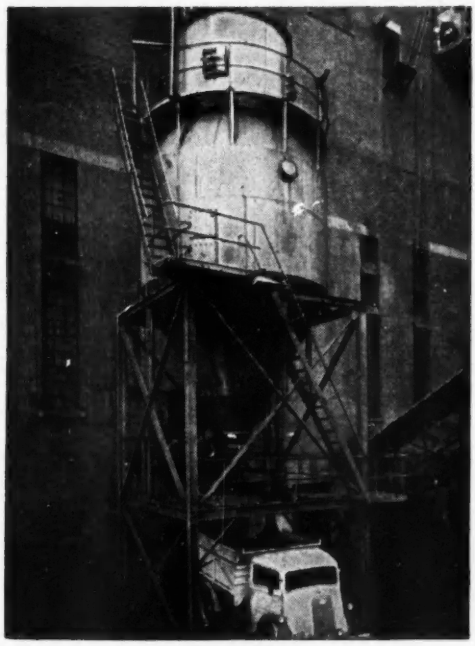
W. SHUPAK & Co. Ltd.
2 Stothard Place, Bishopsgate, London, E.C.2

MEKELITE INDUSTRIAL LIGHTING UNITS

MEK-ELEK Engineering Ltd.
17, Western Road, Mitcham, Surrey

FLUE DUST AND RIDDLINGS

EXTRACTION PLANT



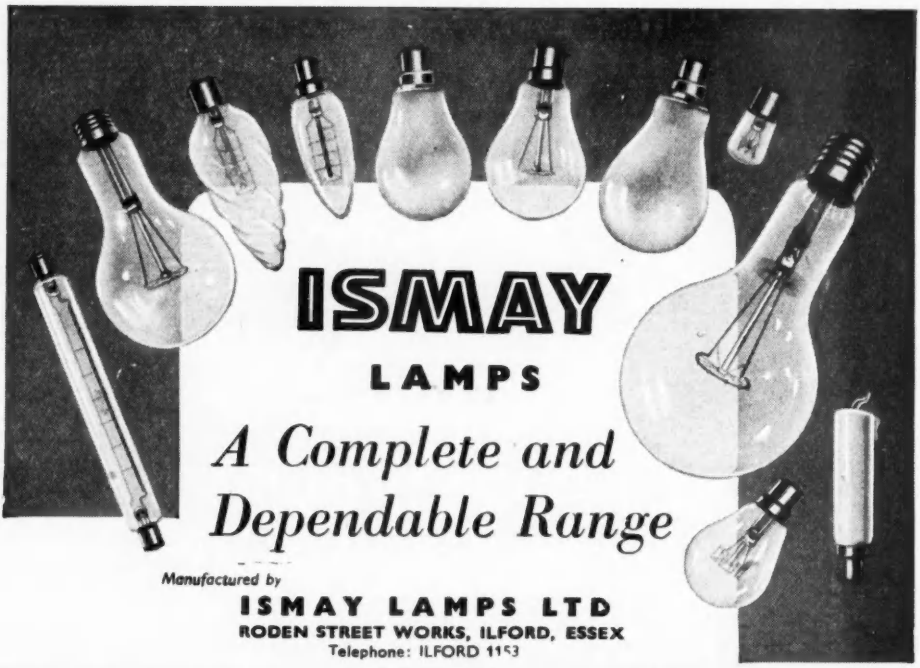
● The Nation's need demands that Coal shall convert every possible fraction of its energy into power for production. The vital contribution that efficient combustion makes to this end is immeasurably facilitated by B.V.C. Flue Dust Removal Plant. This is the recognised method of keeping steam boilers free from accumulations of flue dust, and ensuring that every ton of coal is used to the best possible advantage by removing and consuming the riddlings.

For Information and Consultation write to Dept. 14

B.V.C. INDUSTRIAL CONSTRUCTIONS LTD

(Subsidiary of the British Vacuum Cleaner and Engineering Co., Ltd.)

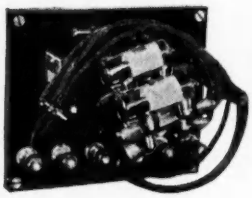
Terminal House, 52 Grosvenor Gardens, London, S.W.1 Sloane 9975/8. Head Office : Leatherhead, Surrey



Manufactured by

ISMAY LAMPS LTD
RODEN STREET WORKS, ILFORD, ESSEX
Telephone: ILFORD 1153

EG **RELAYS and CONTACTORS**



A.I.D. APPROVED AND CONTRACTORS TO: ADMIRALTY, M.A.P., AIR MINISTRY, M.O.S., WAR OFFICE, G.P.O., H.M.O.W., L.C.C., BRITISH RAILWAYS, etc.

Available at all voltages and currents, A.C. or D.C., up to 100 amp. Single, Double or Triple Pole. Also Voltage and Current Sensitive RELAYS, Time-Lag RELAYS. MIDGET RELAYS—Open and Hermetically sealed. M.O.S. approved Types. Plug-in Valve RELAYS. MERCURY SWITCHES. Adjustable and Preset Electric Contact THERMOMETERS.

Write for Catalogue

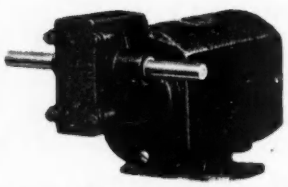
ENGEL & GIBBS LTD.
Warwick Road, Boreham Wood, Herts
Telegrams: "Tormometer, Boreham Wood"
Telephone: ELStree 2291-2-3-4

Chartex **INSULATING MATERIALS**
Regd. Trade Mark

PAPER & FABRIC LAMINATED TUBES, FORMERS, SHEETS & MACHINED PARTS. FIBRE & EBONITE RODS, TUBES & SHEETS

W. H. GRIMMER
50, BOW LANE, CHEAPSIDE, E.C.4
WORKS: ROMFORD, ESSEX
Phone: City 1791-2 Cables: Chartimer, London.

GEARED UNIVERSAL TYPE MOTORS

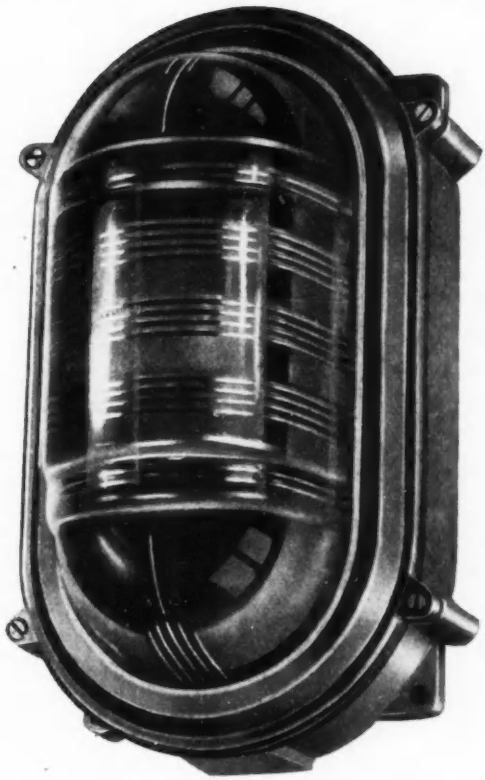


Fractional Motors Suitable for Every Demand

- Torque 10-2lb-inches
- Speed 400—50 rpm
- Suitable for electronic controls
- Built to B.S. specification

HILLMAN ELECTRICAL LTD.
2-3 NORTHWOLD BUILDINGS, NORTHWOLD RD., LONDON, N.16. AMHURST 5274-5

Distinguished Lighting Fittings in Aluminium Alloy



LIST No. S.P.10 100 WATT

MANUFACTURED BY

J. & G. COUGHTRIE LTD.

HILLINGTON, GLASGOW S.W.2

CATALOGUE No. 511 AVAILABLE ON REQUEST

WOOTTON
METER BOARDS
AND SWITCH BLOCKS

We have been making and supplying the Electrical Industry with METER BOARDS and Switch Blocks for over 27 years

- *FIRST CLASS WORK*
- *QUICK DELIVERIES*
- *COMPETITIVE PRICES*

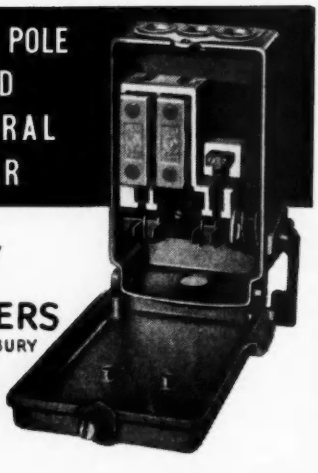
We invite your enquiries

WOOTTON & CO., LTD.
ALMA WORKS, PONDERS END, MIDDLX.
TELEPHONE: HOWARD 1858
L1048A

SINGLE POLE AND NEUTRAL GEAR

by

SANDERS
WEDNESBURY



METAL CLAD SPLITTER FOR CONDUIT ENTRY WITH TWO 15 AMP. OUTGOING FUSES
LIST NO. N401RC.

USE "GUNFIRE"
TRADE MARK
Time Switches
AND
Process Timers
FOR SATISFACTION
AUTOMATIC LIGHT CONTROLLING CO. LTD., BOURNEMOUTH
Established over Fifty Years.

CLANG
EJECTOR PLUG-TOP
(15 amp. 3-pin)
A "MASTERPIECE" OF DESIGN & CONSTRUCTION
Particulars from
CLANG LTD. CROWN YARD CRICKLEWOOD
Telephone Gladstone 4201 N.W.2.

THE EDISON SWAN ELECTRIC CO LTD

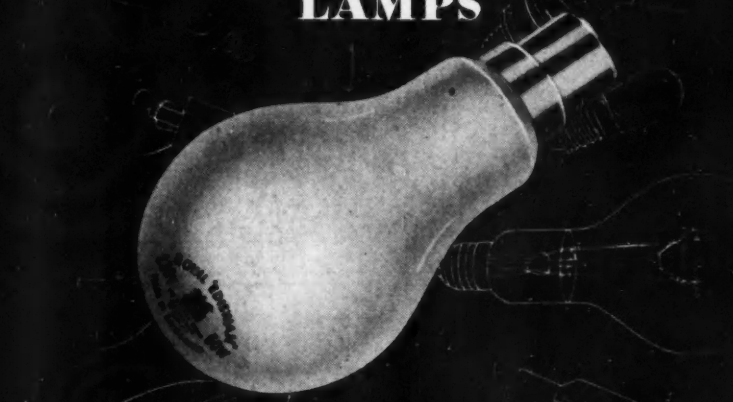
BY APPOINTMENT

SUPPLIERS OF ELECTRIC LAMPS

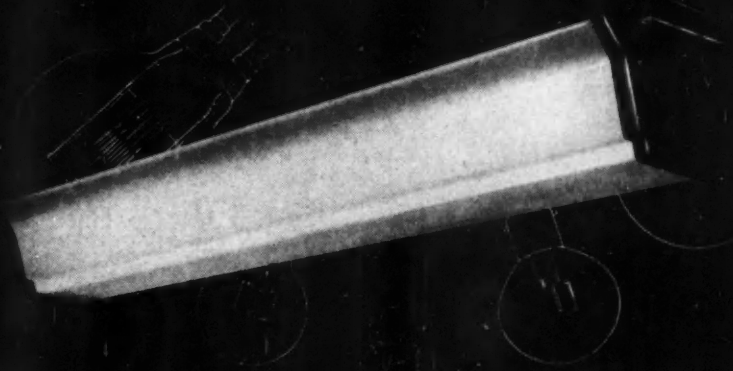
ROYAL

"EDISWAN"

LAMPS



and lighting equipment



THE EDISON SWAN ELECTRIC CO. LTD. 155 CHARING CROSS ROAD, LONDON, W.C.2

Member of the A.E.I. Group of Companies

Burco

THE FINEST ELECTRIC WASHBOILER

BURCO LTD. ROSE GROVE BURNLEY - LANCS

ENORMOUS Reductions

IN HEAT LOSSES AND FUEL CONSUMPTION

EETO

IN SECTIONS for EASY fitting

CONNECTING PIPES OFFER NO DIFFICULTY

CYLINDER JACKETS

EETO Jackets are also made for Horizontal Cylinders, Square and Rectangular Tanks.

EETO INSULATIONS

River Street, Bolton, Lancs. Tel: Bolton 3764

For new and used machine tools . . . power presses . . . sheet metal working and woodworking machinery, etc. . . . F. J. EDWARDS, LIMITED, 359-61, *Euston Road, London, N.W.1. Tel: Euston 4681-3771. 'Grams: Bescotools Norwest London*

INSTRUCTION CHART

For dealing with apparent death from

ELECTRIC SHOCK

(*In accordance with H.O. Electy. Reg.* 29)

Mounted on strong board, varnished and corded for hanging

Price 3/- plus 11d. postage (per single copy)

ELECTRICAL TIMES

Sardinia House, Sardinia St., LONDON, W.C.2

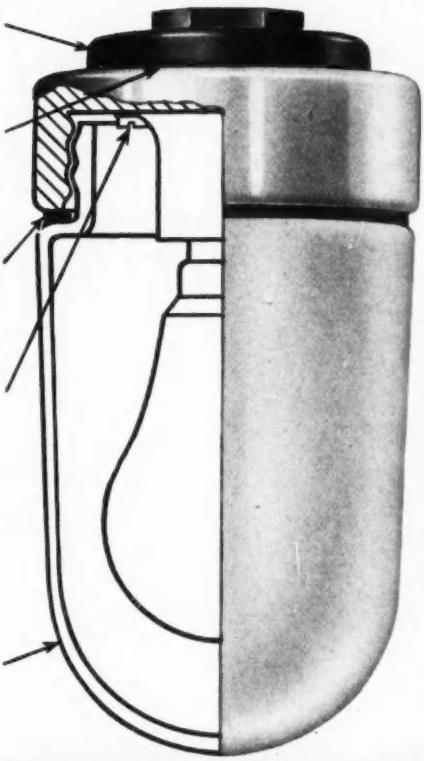
PLATINUM · MERCURY
CONTACTS · PLUGS
OLD GOLD
JEWELLERY
SILVER

Fantastic Prices Paid

ABELSON & CO., LTD.

Refiners (Dept. B), 9 Aberdare Gardens, N.W.6. (Maida Vale 7052)

...but R·E·A·L did it in ONE!


Non-corrodible die-cast top member.
Rubberised asbestos washer.
Heavy gasket providing positive watertight joint.
Fixing screws, 2 in. centres.
All-porcelain body, incorporating lampholder in one piece.
Screw neck pressed glass globe.

Original Porcelain Fittings were designed for use in Chemical works. They were multi-membered and fragile, and found favour merely on account of their non-corrodibility.

Then R.E.A.L. took the matter in hand and produced a fitting that swept away all the disadvantages of earlier types. The R.E.A.L. patent gave a one-piece fitting of exceptional mechanical strength, in which wiring and erection was reduced to its easiest.

The simplicity of the one-piece porcelain body, with its integral lampholder and accurate internal thread, keeps the price at a competitive level . . . and makes the R.E.A.L. fitting ideal for general purposes.

Send for leaflet of complete range of 60, 100 and 200 watt fittings.

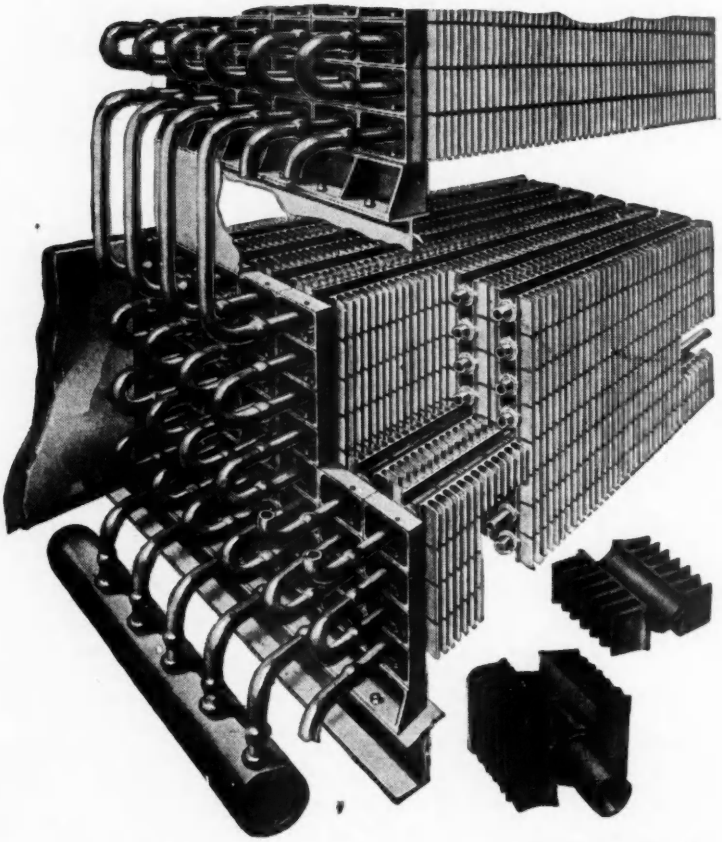
R·E·A·L | *non-corrodible watertight fittings*

THE ONLY SCREW-NECK ONE-PIECE FITTING IN THE WORLD

Issued by ROWLANDS ELECTRICAL ACCESSORIES LTD., R.E.A.L. WORKS, BIRMINGHAM, 18

SENIOR ECONOMISER

WELDED TYPE, FOR CENTRAL POWER STATIONS



Showing construction of Tube Elements

For all operating pressures up to the highest

SENIOR ECONOMISERS LTD., 11 SOUTHAMPTON ROW, LONDON W.C.1

Telephone: HOLborn 7543-4 and 1158

Printed in England for the Proprietors, THE ELECTRICAL TIMES, LTD., by SUN PRINTERS, LTD., London and Watford, Herts, and published at Sardinia House, Sardinia Street, London W.C.2. December 6, 1951

A Moment's Work!

SELF SECURING FUSE CONTACTS

- No Tools Required
- Incorrect Fitting Impossible

10 WAY
T.P. 30 AMP
TYPE VH

The full range of Aeroflex-Fluvent 15 amp. and 30 amp. Fuse Distribution Boards is equipped with Aeroflex High Breaking Capacity Rewirable Cartridge Fuses, which being automatically retained in the fuse bridge, ensure quick replacement of blown cartridges. In addition, these Distribution Boards are fitted with entirely removable end plates, which facilitates drilling for cable glands and conduit holes according to requirements.

● Removable Endplates Facilitates Drilling

AEROFLEX
Fluvent
HOPE'S PATENTS

LONDON: 31 Victoria Street, S.W.1.
GLASGOW: 163 Buchanan Street, C.1.

PARMITER HOPE & SUGDEN LTD.
FLUVENT Electrical Works, Longsight, MANCHESTER, 12

dm FII 25

SMITH METERS
measure accurately

Accuracy is inherent in all Smith Meters: it is built in by correct design and sturdy construction. No other meter incorporates all these features:

Compensation for temperature fluctuation.
Single laminated construction.
Sound scientific design of driving element.
Voltage flux by-pass.
Perfect graph curve at all loads.

Specify SMITH METERS

SMITH METERS LTD · ROWAN ROAD · STREATHAM VALE · LONDON S.W.16
also in LEEDS and DUNBLANE, PERTHSHIRE